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(54) **SYSTEMS AND METHODS TO USE A
DIGITAL CAMERA TO REMOTELY DEPOSIT
A NEGOTIABLE INSTRUMENT**

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3,816,943	A	6/1974	Henry
4,002,356	A	1/1977	Weidmann
4,060,711	A	11/1977	Buros
4,070,649	A	1/1978	Wright, Jr. et al.
4,128,202	A	12/1978	Buros
4,136,471	A	1/1979	Austin
4,205,780	A	6/1980	Burns
4,264,808	A	4/1981	Owens
4,305,216	A	12/1981	Skelton
4,321,672	A	3/1982	Braun
4,433,436	A	2/1984	Carnes

(Continued)

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FOREIGN PATENT DOCUMENTS

EP 0 984 410 A1 3/2000

OTHER PUBLICATIONS

(*) Notice: Subject to any disclaimer, the term of this
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"Best practices for producing quality digital image files," *Digital
Images Guidelines*, http://deepblue.lib.umich.edu/bitstream/2027.42/40247/1/Images-Best_Practice.pdf, downloaded 2007, 2 pages.

(Continued)

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See application file for complete search history.

(57) **ABSTRACT**

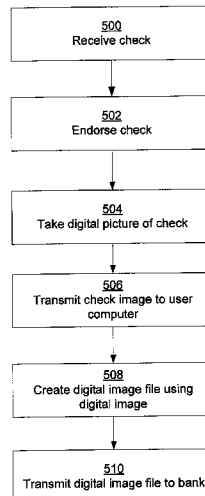
To deposit a negotiable instrument electronically, a digital
image may be used. Systems and methods are described
herein that facilitate the use of a digital camera to provide the
digital image. A user may capture an image of a negotiable
instrument to create a digital image. The digital image may be
compressed and saved as a digital image file. The user may
then transmit the digital image file to a financial institution,
such as a bank, to deposit funds drawn from the account of the
negotiable instrument into the user's account. A financial
institution may receive digital image files created by a digital
camera from account holders and process a deposit request
using the digital image file.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,341,820	A	9/1967	Grillmeier, Jr. et al.
3,576,972	A	5/1971	Wood
3,593,913	A	7/1971	Bremer
3,620,553	A	11/1971	Donovan
3,648,242	A	3/1972	Grosbard
3,800,124	A	3/1974	Walsh

18 Claims, 15 Drawing Sheets



REGIONS 1018

U.S. PATENT DOCUMENTS					
4,454,610 A	6/1984	Sziklai	5,926,548 A	7/1999	Okamoto
RE31,692 E	10/1984	Tyburski et al.	5,930,778 A	7/1999	Geer
4,523,330 A	6/1985	Cain	5,937,396 A	8/1999	Konya
4,636,099 A	1/1987	Goldston	5,940,844 A	8/1999	Cahill
4,640,413 A	2/1987	Kaplan	5,982,918 A	11/1999	Mennie
4,644,144 A	2/1987	Chandek	5,987,439 A	11/1999	Gustin et al.
4,722,444 A	2/1988	Murphy	6,012,048 A	1/2000	Gustin et al.
4,722,544 A	2/1988	Weber	6,014,454 A	1/2000	Kunkler
4,727,435 A	2/1988	Otani et al.	6,021,202 A	2/2000	Anderson
4,774,663 A	9/1988	Musmanno	6,021,397 A	2/2000	Jones
4,790,475 A	12/1988	Griffin	6,029,887 A	2/2000	Furuhashi
4,806,780 A	2/1989	Yamamoto	6,030,000 A	2/2000	Diamond
4,837,693 A	6/1989	Schotz	6,032,137 A	2/2000	Ballard
4,890,228 A	12/1989	Longfield	6,038,553 A	3/2000	Hyde
4,927,071 A	5/1990	Wood	6,053,405 A	4/2000	Irwin, Jr. et al.
4,934,587 A	6/1990	McNabb	6,073,119 A	6/2000	Bornemisza-Wahr
4,960,981 A	10/1990	Benton	6,085,168 A	7/2000	Mori
4,975,735 A	12/1990	Bright	6,097,834 A	8/2000	Krouse
5,022,683 A	6/1991	Barbour	6,097,885 A	8/2000	Rayner
5,053,607 A	10/1991	Carlson	6,105,865 A	8/2000	Hardesty
5,146,606 A	9/1992	Grondalski	6,145,738 A	11/2000	Stinson et al.
5,157,620 A	10/1992	Shaar	6,151,426 A	11/2000	Lee
5,159,548 A	10/1992	Caslavka	6,159,585 A	12/2000	Rittenhouse
5,191,525 A	3/1993	LeBrun	6,170,744 B1	1/2001	Lee
5,220,501 A	6/1993	Lawlor	6,188,506 B1	2/2001	Kaiserman
5,227,863 A	7/1993	Bilbrey et al.	6,189,785 B1	2/2001	Lowery
5,229,589 A	7/1993	Schneider	6,192,165 B1	2/2001	Irons
5,237,159 A	8/1993	Stephens	6,195,694 B1	2/2001	Chen et al.
5,257,320 A	10/1993	Etherington et al.	6,199,055 B1	3/2001	Kara
5,265,008 A	11/1993	Benton	6,236,009 B1	5/2001	Emigh et al.
5,321,816 A	6/1994	Rogan	6,243,689 B1	6/2001	Norton
5,347,302 A	9/1994	Simonoff	6,278,983 B1	8/2001	Ball
5,350,906 A	9/1994	Brody	6,282,826 B1	9/2001	Richards
5,373,550 A	12/1994	Campbell	6,293,469 B1	9/2001	Masson et al.
5,419,588 A	5/1995	Wood	6,304,860 B1	10/2001	Martin
5,422,467 A	6/1995	Graef	6,314,452 B1	11/2001	Dekel
5,475,403 A	12/1995	Havlovick et al.	6,317,727 B1	11/2001	May
5,504,538 A	4/1996	Tsujiyama	6,328,207 B1	12/2001	Gregoire et al.
5,504,677 A	4/1996	Pollin	6,330,546 B1	12/2001	Gopinathan et al.
5,528,387 A	6/1996	Kelly et al.	6,339,658 B1	1/2002	Moccagatta
5,583,759 A	12/1996	Geer	6,363,164 B1	3/2002	Jones et al.
5,590,196 A	12/1996	Moreau	6,390,362 B1	5/2002	Martin
5,594,225 A	1/1997	Botvin	6,397,196 B1	5/2002	Kravetz
5,598,969 A	2/1997	Ong	6,408,084 B1	6/2002	Foley
5,602,936 A	2/1997	Green	6,411,725 B1	6/2002	Rhoads
5,610,726 A	3/1997	Nonoshita	6,411,737 B2	6/2002	Wesolkowski et al.
5,611,028 A	3/1997	Shibasaki	6,411,938 B1	6/2002	Gates et al.
5,630,073 A	5/1997	Nolan	6,413,305 B1	7/2002	Mehta
5,631,984 A	5/1997	Graf et al.	6,417,869 B1	7/2002	Do
5,668,897 A	9/1997	Stolfo	6,425,017 B1	7/2002	Dievendorff
5,673,320 A	9/1997	Ray	6,429,952 B1	8/2002	Olbricht
5,677,955 A	10/1997	Doggett	6,439,454 B1	8/2002	Masson et al.
5,678,046 A	10/1997	Cahill et al.	6,449,397 B1	9/2002	Che-Chu
5,679,938 A	10/1997	Templeton	6,450,403 B1	9/2002	Martens
5,680,611 A	10/1997	Rail	6,464,134 B1	10/2002	Page
5,691,524 A	11/1997	Josephson	6,470,325 B1	10/2002	Leemhuis
5,699,452 A	12/1997	Vaidyanathan	6,505,178 B1	1/2003	Flenley
5,734,747 A	3/1998	Vaidyanathan	6,546,119 B2	4/2003	Ciulli et al.
5,737,440 A	4/1998	Kunkler	6,574,609 B1	6/2003	Downs
5,748,780 A	5/1998	Stolfo	6,578,760 B1	6/2003	Otto
5,751,842 A	5/1998	Riach	6,587,837 B1	7/2003	Spagna
5,784,503 A	7/1998	Bleecker, III et al.	6,606,117 B1	8/2003	Windle
5,830,609 A	11/1998	Warner	6,609,200 B2	8/2003	Anderson
5,832,463 A	11/1998	Funk	6,611,598 B1	8/2003	Hayosh
5,838,814 A	11/1998	Moore	6,614,930 B1	9/2003	Agnihotri et al.
5,863,075 A	1/1999	Rich	6,643,416 B1	11/2003	Daniels
5,870,456 A	2/1999	Rogers	6,654,487 B1	11/2003	Downs, Jr.
5,870,724 A	2/1999	Lawlor	6,661,910 B2	12/2003	Jones et al.
5,870,725 A	2/1999	Bellinger et al.	6,672,452 B1	1/2004	Alves
5,878,337 A	3/1999	Joao	6,682,452 B2	1/2004	Quintus
5,893,101 A	4/1999	Balogh et al.	6,695,204 B1	2/2004	Stinson
5,897,625 A	4/1999	Gustin	6,711,474 B1	3/2004	Treyz et al.
5,901,253 A	5/1999	Tretter	6,726,097 B2	4/2004	Graef
5,903,878 A	5/1999	Talati	6,728,397 B2	4/2004	Mcneal
5,903,881 A	5/1999	Schrader	6,738,496 B1	5/2004	Van Hall
5,910,988 A	6/1999	Ballard	6,742,128 B1	5/2004	Joiner
5,917,931 A	6/1999	Kunkler	6,745,186 B1	6/2004	Testa et al.
5,924,737 A	7/1999	Schrupp	6,755,340 B1	6/2004	Voss
			6,763,226 B1	7/2004	McZeal

US 8,290,237 B1

Page 3

6,781,962	B1	8/2004	Williams	7,403,917	B1	7/2008	Larsen
6,786,398	B1	9/2004	Stinson	7,406,198	B2	7/2008	Aoki et al.
6,789,054	B1	9/2004	Makhlouf	7,421,107	B2	9/2008	Lugg
6,796,491	B2	9/2004	Nakajima	7,421,410	B1	9/2008	Schechtman et al.
6,806,903	B1	10/2004	Okisu et al.	7,433,098	B2	10/2008	Klein et al.
6,813,733	B1	11/2004	Li	7,437,327	B2	10/2008	Lam
6,829,704	B2	12/2004	Zhang	7,440,924	B2	10/2008	Buchanan
6,844,885	B2	1/2005	Anderson	7,447,347	B2	11/2008	Weber
6,856,965	B1	2/2005	Stinson	7,455,220	B2	11/2008	Phillips
6,863,214	B2	3/2005	Garner et al.	7,455,221	B2	11/2008	Sheaffer
6,870,947	B2	3/2005	Kelland	7,460,108	B2	12/2008	Tamura
6,883,140	B1	4/2005	Acker	7,461,779	B2	12/2008	Ramachandran
6,898,314	B2 *	5/2005	Kung et al. 382/180	7,461,780	B2	12/2008	Potts
6,902,105	B2	6/2005	Koakutsu	7,471,818	B1	12/2008	Price
6,913,188	B2	7/2005	Wong	7,475,040	B2	1/2009	Buchanan
6,931,591	B1	8/2005	Brown	7,477,923	B2	1/2009	Wallmark
6,934,719	B2	8/2005	Nally	7,480,382	B2	1/2009	Dunbar
6,957,770	B1	10/2005	Robinson	7,480,422	B2	1/2009	Ackley et al.
6,961,689	B1	11/2005	Greenberg	7,489,953	B2	2/2009	Griffin
6,970,843	B1	11/2005	Forte	7,490,242	B2	2/2009	Torres
6,973,589	B2	12/2005	Wright	7,497,429	B2	3/2009	Reynders
6,983,886	B2	1/2006	Natsukari et al.	7,503,486	B2	3/2009	Ahles
6,993,507	B2	1/2006	Meyer	7,505,759	B1	3/2009	Rahman
6,996,263	B2	2/2006	Jones et al.	7,506,261	B2	3/2009	Satou
6,999,943	B1	2/2006	Johnson	7,509,287	B2	3/2009	Nutahara
7,003,040	B2	2/2006	Yi	7,512,564	B1	3/2009	Geer
7,004,382	B2	2/2006	Sandru	7,519,560	B2	4/2009	Lam
7,010,155	B2 *	3/2006	Koakutsu et al. 382/137	7,520,420	B2	4/2009	Phillips
7,010,507	B1	3/2006	Anderson	7,520,422	B1	4/2009	Robinson et al.
7,016,704	B2	3/2006	Pallakoff	7,536,354	B1	5/2009	deGroeve et al.
7,039,048	B1	5/2006	Monta	7,536,440	B2	5/2009	Budd
7,058,036	B1	6/2006	Yu	7,539,646	B2	5/2009	Gilder
7,062,099	B2	6/2006	Li et al.	7,540,408	B2	6/2009	Levine
7,062,456	B1	6/2006	Riehl et al.	7,542,598	B2	6/2009	Jones
7,062,768	B2	6/2006	Kubo	7,545,529	B2	6/2009	Borrey et al.
7,072,862	B1	7/2006	Wilson	7,548,641	B2	6/2009	Gilson et al.
7,076,458	B2	7/2006	Lawlor et al.	7,566,002	B2	7/2009	Love et al.
7,086,003	B2	8/2006	Demsky	7,571,848	B2	8/2009	Cohen
7,092,561	B2	8/2006	Downs, Jr.	7,587,066	B2	9/2009	Cordery et al.
7,104,443	B1	9/2006	Paul et al.	7,587,363	B2	9/2009	Cataline
7,113,925	B2	9/2006	Waserstein	7,590,275	B2	9/2009	Clarke et al.
7,114,649	B2	10/2006	Nelson	7,599,543	B2	10/2009	Jones
7,139,594	B2	11/2006	Nagatomo	7,599,888	B2	10/2009	Manfre
7,140,539	B1	11/2006	Crews	7,602,956	B2	10/2009	Jones
7,163,347	B2	1/2007	Lugg	7,606,762	B1	10/2009	Heit
7,178,721	B2	2/2007	Maloney	7,609,873	B2	10/2009	Foth
7,181,430	B1	2/2007	Buchanan et al.	7,619,721	B2	11/2009	Jones
7,184,980	B2	2/2007	Allen-Rouman et al.	7,620,231	B2	11/2009	Jones
7,197,173	B2	3/2007	Jones et al.	7,620,604	B1	11/2009	Bueche, Jr.
7,200,255	B2	4/2007	Jones	7,644,043	B2	1/2010	Minowa
7,204,412	B2	4/2007	Foss, Jr.	7,647,275	B2	1/2010	Jones
7,216,106	B1	5/2007	Buchanan	7,668,363	B2	2/2010	Price
7,219,082	B2	5/2007	Forte	7,672,940	B2	3/2010	Viola
7,219,831	B2	5/2007	Murata	7,676,409	B1	3/2010	Ahmad
7,249,076	B1	7/2007	Pendleton	7,680,735	B1	3/2010	Loy
7,252,224	B2	8/2007	Verma	7,689,482	B2	3/2010	Lam
7,266,230	B2	9/2007	Doran	7,697,776	B2	4/2010	Wu et al.
7,290,034	B2	10/2007	Budd	7,698,222	B1	4/2010	Bueche, Jr.
7,299,970	B1	11/2007	Ching	7,702,588	B2	4/2010	Gilder et al.
7,299,979	B2	11/2007	Phillips	7,734,545	B1	6/2010	Fogliano
7,313,543	B1	12/2007	Crane	7,743,979	B2	6/2010	Fredman
7,314,163	B1	1/2008	Crews et al.	7,753,268	B1	7/2010	Robinson et al.
7,321,874	B2	1/2008	Dilip	7,766,244	B1	8/2010	Field
7,321,875	B2	1/2008	Dilip	7,769,650	B2	8/2010	Bleunven
7,325,725	B2	2/2008	Foss, Jr.	7,792,752	B1	9/2010	Kay
7,328,190	B2	2/2008	Smith et al.	7,792,753	B1	9/2010	Slater et al.
7,330,604	B2	2/2008	Wu et al.	7,810,714	B2	10/2010	Murata
7,336,813	B2 *	2/2008	Prakash et al. 382/139	7,818,245	B2	10/2010	Prakash et al.
7,343,320	B1	3/2008	Treyz	7,856,402	B1	12/2010	Kay
7,349,566	B2	3/2008	Jones et al.	7,873,200	B1 *	1/2011	Oakes et al. 382/137
7,356,505	B2	4/2008	March	7,876,949	B1 *	1/2011	Oakes et al. 382/137
7,377,425	B1	5/2008	Ma	7,885,451	B1	2/2011	Walls et al.
7,379,978	B2	5/2008	Anderson	7,885,880	B1	2/2011	Prasad et al.
7,385,631	B2	6/2008	Maeno	7,894,094	B2	2/2011	Nacman et al.
7,386,511	B2	6/2008	Buchanan	7,896,232	B1	3/2011	Prasad et al.
7,391,897	B2	6/2008	Jones	7,900,822	B1	3/2011	Prasad et al.
7,391,934	B2	6/2008	Goodall et al.	7,912,785	B1	3/2011	Kay
7,392,935	B2	7/2008	Byrne	7,949,587	B1	5/2011	Morris et al.
7,401,048	B2	7/2008	Rosedale	7,962,411	B1	6/2011	Prasad et al.

US 8,290,237 B1

Page 4

7,970,677	B1	6/2011	Oakes, III et al.	2004/0058705	A1	3/2004	Morgan	
7,974,899	B1	7/2011	Prasad et al.	2004/0066031	A1	4/2004	Wong	
7,978,900	B2	7/2011	Nepomniachtchi et al.	2004/0069841	A1	4/2004	Wong	
7,996,314	B1	8/2011	Smith et al.	2004/0071333	A1	4/2004	Douglas et al.	
7,996,315	B1	8/2011	Smith et al.	2004/0076320	A1	4/2004	Downs, Jr.	
7,996,316	B1	8/2011	Smith et al.	2004/0078299	A1	4/2004	Down-Logan	
8,001,051	B1	8/2011	Smith et al.	2004/0080795	A1	4/2004	Bean et al.	
8,046,301	B1	10/2011	Smith et al.	2004/0089711	A1	5/2004	Sandru	
2001/0014881	A1	8/2001	Drummond	2004/0093303	A1	5/2004	Picciallo	
2001/0018739	A1	8/2001	Anderson	2004/0093305	A1	5/2004	Kight	
2001/0027994	A1	10/2001	Hayashida	2004/0103057	A1	5/2004	Melbert et al.	
2001/0042171	A1	11/2001	Vermeulen	2004/0103296	A1	5/2004	Harp	
2001/0042785	A1	11/2001	Walker	2004/0109596	A1	6/2004	Doran	
2001/0043748	A1	11/2001	Wesolkowski	2004/0110975	A1	6/2004	Osinski et al.	
2001/0047330	A1	11/2001	Gephart	2004/0117302	A1	6/2004	Weichert	
2001/0054020	A1	12/2001	Barth et al.	2004/0122754	A1	6/2004	Stevens	
2002/0001393	A1	1/2002	Jones	2004/0133511	A1	7/2004	Smith et al.	
2002/0016763	A1	2/2002	March	2004/0138974	A1	7/2004	Shimamura	
2002/0016769	A1	2/2002	Barbara et al.	2004/0148235	A1	7/2004	Craig	
2002/0032656	A1	3/2002	Chen	2004/0158549	A1	8/2004	Matena	
2002/0038289	A1	3/2002	Lawlor et al.	2004/0165096	A1	8/2004	Maeno	
2002/0052841	A1	5/2002	Guthrie	2004/0170259	A1	9/2004	Park	
2002/0052853	A1	5/2002	Munoz	2004/0210515	A1	10/2004	Hughes	
2002/0065786	A1	5/2002	Martens et al.	2004/0210523	A1	10/2004	Gains et al.	
2002/0072974	A1	6/2002	Pugliese	2004/0228277	A1	11/2004	Williams	
2002/0075524	A1	6/2002	Blair	2004/0236647	A1	11/2004	Acharya	
2002/0084321	A1	7/2002	Martens	2004/0236688	A1	11/2004	Bozeman	
2002/0087467	A1	7/2002	Mascavage, III et al.	2004/0240722	A1	12/2004	Tsuji et al.	
2002/0107809	A1	8/2002	Biddle et al.	2004/0245324	A1	12/2004	Chen	
2002/0116329	A1	8/2002	Serbetcioglu	2004/0247199	A1*	12/2004	Murai et al.	382/274
2002/0116335	A1	8/2002	Star	2004/0248600	A1	12/2004	Kim	
2002/0118891	A1	8/2002	Rudd	2004/0252679	A1	12/2004	Williams	
2002/0120562	A1	8/2002	Opiela	2004/0260636	A1	12/2004	Marceau	
2002/0129249	A1	9/2002	Maillard et al.	2004/0267666	A1	12/2004	Minami	
2002/0133409	A1	9/2002	Sawano et al.	2005/0001421	A1	1/2005	Luth et al.	
2002/0138522	A1	9/2002	Muralidhar	2005/0010108	A1*	1/2005	Rahn et al.	600/425
2002/0147798	A1	10/2002	Huang	2005/0021466	A1	1/2005	Buchanan et al.	
2002/0150279	A1	10/2002	Scott	2005/0033645	A1	2/2005	Duphily	
2002/0152160	A1	10/2002	Allen-Rouman et al.	2005/0033685	A1	2/2005	Reyes	
2002/0152161	A1	10/2002	Aoike	2005/0033695	A1	2/2005	Minowa	
2002/0152164	A1	10/2002	Dutta	2005/0035193	A1	2/2005	Gustin et al.	
2002/0152165	A1	10/2002	Dutta et al.	2005/0038746	A1	2/2005	Latimer et al.	
2002/0152169	A1	10/2002	Dutta	2005/0038754	A1	2/2005	Geist	
2002/0171820	A1	11/2002	Okamura	2005/0044042	A1	2/2005	Mendiola	
2002/0178112	A1	11/2002	Goeller	2005/0044577	A1	2/2005	Jerding	
2002/0188564	A1	12/2002	Star	2005/0049950	A1	3/2005	Johnson	
2002/0195485	A1	12/2002	Pomerleau et al.	2005/0071283	A1	3/2005	Randle et al.	
2003/0005326	A1	1/2003	Flemming	2005/0075969	A1	4/2005	Nielson et al.	
2003/0023557	A1	1/2003	Moore	2005/0075974	A1	4/2005	Turgeon	
2003/0038227	A1	2/2003	Sesek	2005/0078336	A1	4/2005	Ferlitsch	
2003/0055756	A1	3/2003	Allan	2005/0080725	A1	4/2005	Pick	
2003/0055776	A1	3/2003	Samuelson	2005/0082364	A1	4/2005	Alvarez et al.	
2003/0074315	A1	4/2003	Lam	2005/0086140	A1	4/2005	Ireland	
2003/0075596	A1	4/2003	Koakutsu	2005/0086168	A1	4/2005	Alvarez	
2003/0075916	A1	4/2003	Gorski	2005/0091161	A1	4/2005	Gustin	
2003/0081824	A1	5/2003	Mennie	2005/0096992	A1	5/2005	Geisel	
2003/0093367	A1	5/2003	Allen-Rouman et al.	2005/0097046	A1	5/2005	Singfield	
2003/0093369	A1	5/2003	Ijichi et al.	2005/0108164	A1	5/2005	Salafia	
2003/0102714	A1	6/2003	Rhodes et al.	2005/0108168	A1	5/2005	Halpin	
2003/0105688	A1	6/2003	Brown et al.	2005/0115110	A1	6/2005	Dinkins	
2003/0105714	A1	6/2003	Alarcon-Luther et al.	2005/0127160	A1	6/2005	Fujikawa	
2003/0139999	A1	7/2003	Rowe	2005/0131820	A1	6/2005	Rodriguez	
2003/0159046	A1	8/2003	Choi et al.	2005/0149436	A1	7/2005	Elterich	
2003/0167225	A1	9/2003	Adams	2005/0168566	A1	8/2005	Tada	
2003/0191615	A1	10/2003	Bailey	2005/0171899	A1	8/2005	Dunn	
2003/0191869	A1	10/2003	Williams	2005/0171907	A1	8/2005	Lewis	
2003/0200174	A1	10/2003	Star	2005/0177499	A1	8/2005	Thomas	
2003/0212904	A1	11/2003	Randle et al.	2005/0177518	A1	8/2005	Brown	
2003/0217005	A1	11/2003	Drummond et al.	2005/0182710	A1	8/2005	Andersson	
2003/0225705	A1	12/2003	Park et al.	2005/0188306	A1	8/2005	Mackenzie	
2003/0233278	A1	12/2003	Marshall	2005/0205661	A1	9/2005	Taylor	
2003/0233318	A1	12/2003	King et al.	2005/0209961	A1	9/2005	Michelsen	
2004/0010466	A1	1/2004	Anderson	2005/0228733	A1	10/2005	Bent et al.	
2004/0012496	A1	1/2004	De Souza	2005/0252955	A1	11/2005	Sugai	
2004/0013284	A1	1/2004	Yu	2005/0267843	A1	12/2005	Acharya et al.	
2004/0024626	A1	2/2004	Bruijning	2005/0268107	A1	12/2005	Harris et al.	
2004/0024708	A1	2/2004	Masuda	2005/0269412	A1	12/2005	Chiu	
2004/0030741	A1	2/2004	Wolton et al.	2005/0273368	A1	12/2005	Hutten et al.	
2004/0057697	A1	3/2004	Renzi	2005/0278250	A1	12/2005	Zair	

2005/0281448	A1	12/2005	Lugg	2007/0140545	A1	6/2007	Rossignoli
2005/0281471	A1	12/2005	LeConte	2007/0140594	A1	6/2007	Franklin
2005/0281474	A1	12/2005	Huang	2007/0143208	A1	6/2007	Varga
2005/0289030	A1	12/2005	Smith	2007/0150337	A1	6/2007	Hawkins et al.
2005/0289182	A1	12/2005	Pandian et al.	2007/0156438	A1	7/2007	Popadic
2006/0002426	A1	1/2006	Madour	2007/0168265	A1	7/2007	Rosenberger
2006/0004660	A1	1/2006	Pranger	2007/0171288	A1	7/2007	Inoue
2006/0025697	A1	2/2006	Kurzweil	2007/0172107	A1	7/2007	Jones et al.
2006/0039628	A1	2/2006	Li et al.	2007/0172148	A1	7/2007	Hawley
2006/0039629	A1	2/2006	Li	2007/0179883	A1 *	8/2007	Questembert 705/39
2006/0041506	A1	2/2006	Mason et al.	2007/0183000	A1	8/2007	Eisen et al.
2006/0045321	A1	3/2006	Yu	2007/0194102	A1	8/2007	Cohen
2006/0047593	A1	3/2006	Naratil	2007/0198432	A1	8/2007	Pitroda et al.
2006/0053056	A1	3/2006	Alspach-Goss	2007/0203708	A1	8/2007	Polcyn et al.
2006/0059085	A1	3/2006	Tucker	2007/0208816	A1	9/2007	Baldwin et al.
2006/0064368	A1	3/2006	Forté	2007/0235518	A1	10/2007	Mueller et al.
2006/0080245	A1	4/2006	Bahl	2007/0235520	A1	10/2007	Smith et al.
2006/0085357	A1	4/2006	Pizarro	2007/0241179	A1	10/2007	Davis
2006/0102704	A1	5/2006	Reynders	2007/0244782	A1	10/2007	Chimento
2006/0106691	A1	5/2006	Sheaffer	2007/0246525	A1	10/2007	Smith et al.
2006/0106717	A1	5/2006	Randle	2007/0251992	A1	11/2007	Sharma et al.
2006/0110063	A1	5/2006	Weiss	2007/0255652	A1	11/2007	Tumminaro
2006/0112013	A1 *	5/2006	Maloney 705/45	2007/0255653	A1	11/2007	Tumminaro
2006/0115110	A1	6/2006	Rodriguez	2007/0255662	A1	11/2007	Tumminaro
2006/0115141	A1	6/2006	Koakutsu et al.	2007/0258634	A1	11/2007	Simonoff
2006/0118613	A1	6/2006	McMann	2007/0271182	A1	11/2007	Prakash et al.
2006/0144924	A1	7/2006	Stover	2007/0278286	A1	12/2007	Crowell et al.
2006/0144950	A1	7/2006	Johnson	2007/0288380	A1	12/2007	Starrs
2006/0161501	A1	7/2006	Waserstein	2007/0288382	A1	12/2007	Narayanan et al.
2006/0164682	A1	7/2006	Lev	2007/0295803	A1	12/2007	Levine et al.
2006/0167818	A1	7/2006	Wentker et al.	2008/0002911	A1	1/2008	Eisen
2006/0182331	A1	8/2006	Gilson et al.	2008/0021802	A1	1/2008	Pendleton
2006/0182332	A1 *	8/2006	Weber 382/139	2008/0040280	A1	2/2008	Davis et al.
2006/0206506	A1	9/2006	Fitzpatrick	2008/0052182	A1	2/2008	Marshall
2006/0210138	A1	9/2006	Hilton et al.	2008/0059376	A1	3/2008	Davis
2006/0214940	A1	9/2006	Kinoshita	2008/0063253	A1	3/2008	Wood
2006/0215204	A1	9/2006	Miyamoto et al.	2008/0068674	A1	3/2008	McIntyre
2006/0215230	A1	9/2006	Borrey et al.	2008/0071721	A1	3/2008	Wang
2006/0222260	A1 *	10/2006	Sambongi et al. 382/274	2008/0080760	A1	4/2008	Ronca
2006/0229976	A1	10/2006	Jung	2008/0086420	A1	4/2008	Gilder et al.
2006/0229986	A1	10/2006	Corder	2008/0086421	A1	4/2008	Gilder
2006/0238503	A1	10/2006	Smith	2008/0091599	A1	4/2008	Foss, Jr.
2006/0242062	A1	10/2006	Peterson	2008/0097899	A1	4/2008	Jackson et al.
2006/0242063	A1	10/2006	Peterson	2008/0103790	A1	5/2008	Abernethy
2006/0249567	A1	11/2006	Byrne	2008/0103967	A1	5/2008	Ackert et al.
2006/0274164	A1	12/2006	Kimura et al.	2008/0113674	A1	5/2008	Baig
2006/0279628	A1	12/2006	Fleming	2008/0114739	A1	5/2008	Hayes
2006/0282383	A1	12/2006	Doran	2008/0117991	A1	5/2008	Peddireddy
2006/0291744	A1 *	12/2006	Ikeda et al. 382/275	2008/0119178	A1	5/2008	Peddireddy
2007/0016796	A1	1/2007	Singhal	2008/0133411	A1	6/2008	Jones et al.
2007/0019243	A1	1/2007	Sato	2008/0147549	A1	6/2008	Rathbun
2007/0022053	A1	1/2007	Waserstein	2008/0156438	A1	7/2008	Stumphauzer et al.
2007/0027802	A1	2/2007	VanDeburg et al.	2008/0162350	A1	7/2008	Allen-Rouman et al.
2007/0031022	A1	2/2007	Frew	2008/0162371	A1	7/2008	Rampell et al.
2007/0038561	A1	2/2007	Vancini et al.	2008/0177659	A1	7/2008	Lacey et al.
2007/0041629	A1 *	2/2007	Prakash et al. 382/139	2008/0180750	A1	7/2008	Feldman
2007/0050292	A1	3/2007	Yarbrough	2008/0208727	A1	8/2008	McLaughlin et al.
2007/0053574	A1	3/2007	Verma et al.	2008/0214180	A1	9/2008	Cunningham et al.
2007/0058851	A1	3/2007	Quine	2008/0219543	A1	9/2008	Csulits
2007/0063016	A1	3/2007	Myatt	2008/0245869	A1	10/2008	Berkun et al.
2007/0064991	A1	3/2007	Douglas et al.	2008/0247629	A1	10/2008	Gilder
2007/0065143	A1	3/2007	Didow et al.	2008/0247655	A1	10/2008	Yano
2007/0075772	A1	4/2007	Kokubo	2008/0249931	A1	10/2008	Gilder
2007/0076940	A1	4/2007	Goodall et al.	2008/0249951	A1	10/2008	Gilder et al.
2007/0076941	A1 *	4/2007	Carreon et al. 382/137	2008/0262953	A1	10/2008	Anderson
2007/0077921	A1	4/2007	Hayashi	2008/0275821	A1	11/2008	Bishop et al.
2007/0080207	A1	4/2007	Williams	2008/0316542	A1	12/2008	Mindrum et al.
2007/0082700	A1	4/2007	Landschaft	2009/0024520	A1	1/2009	Drory et al.
2007/0084911	A1	4/2007	Crowell	2009/0046938	A1	2/2009	Yoder
2007/0086642	A1 *	4/2007	Foth et al. 382/137	2009/0060396	A1	3/2009	Blessan et al.
2007/0086643	A1	4/2007	Spier	2009/0108080	A1	4/2009	Meyer
2007/0094088	A1	4/2007	Mastie	2009/0110281	A1	4/2009	Hirabayashi
2007/0100748	A1	5/2007	Dheer	2009/0141962	A1	6/2009	Borgia et al.
2007/0110277	A1	5/2007	Hayduchok et al.	2009/0171819	A1	7/2009	Von der Emde et al.
2007/0118472	A1	5/2007	Allen-Rouman et al.	2009/0171825	A1	7/2009	Roman
2007/0122024	A1	5/2007	Haas et al.	2009/0173781	A1	7/2009	Ramachandran
2007/0127805	A1	6/2007	Foth et al.	2009/0190823	A1	7/2009	Walters
2007/0129955	A1	6/2007	Dalmia	2009/0192938	A1	7/2009	Amos
2007/0136198	A1	6/2007	Foth et al.	2009/0236413	A1	9/2009	Mueller et al.

2009/0252437	A1	10/2009	Li
2009/0281904	A1	11/2009	Pharris
2009/0313167	A1	12/2009	Dujari
2010/0007899	A1	1/2010	Lay
2010/0027679	A1	2/2010	Sunahara et al.
2010/0047000	A1	2/2010	Park et al.
2010/0057578	A1	3/2010	Blair et al.
2010/0061446	A1	3/2010	Hands et al.
2010/0082470	A1	4/2010	Walach
2010/0165015	A1	7/2010	Barkley et al.
2010/0260408	A1	10/2010	Prakash et al.
2010/0262522	A1	10/2010	Anderson et al.
2010/0312705	A1	12/2010	Caruso et al.
2011/0112967	A1	5/2011	Anderson et al.

OTHER PUBLICATIONS

"Picture this: Check 21 uses digital technology to speed check processing and shorten lag time," *Columbus Business First*, <http://columbus.bizjournals.com/columbus/stories/2005/03/14/focus1.html>, downloaded 2007, 3 pages.

"Accept "Customer Not Present" Checks," *Accept Check Online*, <http://checksoftware.com>, Cited in patent No. 7,900,822, as dated 2007 (1 pg).

"Adjusting Brightness and Contrast," www.eaglesoftware.com/adjustin.htm, retrieved on May 4, 2009 (4 pages).

"Chapter 7 Payroll Programs," *Uniform Staff Payroll System*, http://www2.oecn.k12.oh.us/www/ssdt/usps/usps_user_guide_005.html, Cited in patent No. 7,900,822, as dated 2007 (9 pgs).

"Check 21—The check is not in the post", RedTitan Technology 2004 <http://www.redtitan.com/check21/htm> (3 pgs).

"Check 21 Solutions," *Columbia Financial International, Inc.* <http://www.columbiafinancial.us/check21/solutions.htm>, Cited in patent No. 7,900,822, as dated 2007 (8 pgs).

"Check Fraud: A Guide to Avoiding Losses", All Net, <http://all.net/books/audit/checkfraud/security.htm>, Cited in patent No. 7,900,822, as dated 2007 (1 pg).

"Compliance with Regulation CC", <http://www.federalreserve.gov/Pubs/regcc/regcc.htm>, Jan. 24, 2006 (6 pgs).

"Customer Personalized Bank Checks and Address Labels" *Checks Your Way Inc.*, http://www.checksyourway.com/htm/web_pages/faq.htm, Cited in patent No. 7,900,822, as dated 2007 (6 pgs).

"Direct Deposit Application for Payroll", *Purdue University, Business Office Form 0003*, <http://purdue.edu/payroll/pdf/directdepositapplication.pdf>, Jul. 2007 (2 pgs).

"Direct Deposit Authorization Form", www.umass.edu/humres/library/DDForm.pdf, May 2003 (3 pgs).

"Direct Deposit," *University of Washington*, <http://www.washington.edu/admin/payroll/directdeposit.html>, Cited in patent No. 7,900,822, as dated 2007 (3 pgs).

"Electronic Billing Problem: The E-check is in the mail" *American Banker*—vol. 168, No. 95, May 19, 2003 (4 pgs).

"Frequently Asked Questions" *Bank of America*, http://www.bankofamerica.com/deposits/checksave/index.cfm?template=lc_faq_byemail, Cited in patent No. 7,900,822, as dated 2007 (2 pgs).

"Full Service Direct Deposit", www.nonprofitstaffing.com/images/upload/dirdepform.pdf, Cited in patent No. 7,900,822, as dated 2001, (2 pgs).

"How to Digitally Deposit a Check Image," *Smart Money Daily*, Copyright 2008 (5 pgs).

"ImageNet Mobile Deposit Provides Convenient Check Deposit and Bill Pay to Mobile Consumers," *Mitek Systems*, 2008 (2 pgs).

"It's the easiest way to Switch banks", *LNB*, <http://www.inbky.com/pdf/LNBswitch-kit10-07.pdf> Cited in patent No. 7,996,316, as dated 2007 (7 pgs).

"Lesson 38—More Bank Transactions", *Turtle Soft*, <http://www.turtlesoft.com/goldenseal-software-manual.lesson38.htm>, Cited in patent No. 7,900,822, as dated 2007 (8 pgs).

"Middleware", David E. Bakken, *Encyclopedia of Distributed Computing*, Kluwer Academic Press, 2001 (6 pgs).

"Mitek Systems Announces Mobile Deposit Application for Apple iPhone," [http://prnewswire.com/cgi-bin/stories.pl?ACCT=104&STORY=/www/story/10-01-](http://prnewswire.com/cgi-bin/stories.pl?ACCT=104&STORY=/www/story/10-01-...) . . . , Nov. 25, 2008, pp. 1-2.

"Personal Finance", *PNC*, <http://www.pnc.com/webapp/unsec/productsandservice.do?sitearea=PNC/home/personal/account+services/quick+switch/quick+switch+faqs>, Cited in patent No. 7,900,822, as dated 2007 (12 pgs).

"Refractive index" *Wikipedia*, the free encyclopedia; <http://en.wikipedia.org/wiki/refractiveindex.com> Oct. 16, 2007 (4 pgs).

"Remote Deposit Capture", *Plante & Moran*, <http://plantemoran.com/industries/fincial/institutions/bank/resources/community+bank+advisor/2007+summer+issue/remote+deposit+capture.htm>, Cited in patent No. 7,900,822, as dated 2007 (3 pgs).

"Remote Deposit" *National City*, <http://www.nationalcity.com/smallbusiness/cashmanagement/remotedeposit/default.asp>; Cited in patent No. 7,900,822, as dated 2007 (1 pg).

"Save on ATM Fees", *RedEye Edition*, *Chicago Tribune*, Chicago, IL Jun. 30, 2007 (2 pgs).

"Switching Made Easy," *Bank of North Georgia*, <http://www.banknorthgeorgia.com/cmsmaster/documents/286/documents616.pdf>, 2007 (7 pgs).

"Two Words Every Business Should Know: Remote Deposit," *Canon*, http://www.rpsolutions.com/rpweb/pdfs/canon_rdc.pdf, 2005 (7 pgs).

"Virtual Bank Checks", *Morebusiness.com*, http://www.morebusiness.com/running_yourbusiness/businessbits/d908484987.brc, Cited in patent No. 7,900,822, as dated 2007 (3 pgs).

"WallStreetGrapevine.com" *Stocks on the Rise: JADG, BKYL, MITK*; Mar. 3, 2008 (4 pgs).

"What is check Fraud", *National Check Fraud Center*, <http://www.ckfraud.org/ckfraud.html>, Cited in patent No. 7,900,822, as dated 2007 (12 pgs).

Affinity Federal Credit Union, "Affinity Announces Online Deposit," Aug. 4, 2005 (1 pg).

Albrecht, W. Steve, "Check Kiting: Detection, Prosecution and Prevention," *The FBI Law Enforcement Bulletin*, Nov. 1, 1993. (6 pgs).
Alves, Vander and Borba, Paulo; "Distributed Adapters Pattern: A Design for Object-Oriented Distributed Applications"; *First Latin American Conference on Pattern Languages of Programming*; Oct. 2001; pp. 132-142; Rio de Janeiro, Brazil (11 pgs).

Anderson, Milton M. "FSML and Echeck", *Financial Services Technology Consortium*, 1999 (17 pgs).

Archive Index Systems; *Panini My Vision X-30 or VX30 or X30 © 1994-2008 Archive Systems, Inc.* P/O. Box 40135 Bellevue, WA USA 98015 (2 pgs).

Associate of German Banks, SEPA 2008: Uniform Payment Instruments for Europe, Berlin, Cited in patent No. 7,900,822, as dated Jul. 2007, Bundesverband deutscher banker ev (42 pgs).

Automated Merchant Systems, Inc., "Electronic Check Conversion," http://www.automatedmerchant.com/electronic_check_conversion.cfm, 2006, downloaded Oct. 18, 2006 (3 pgs).

Bank Systems & Technology, *Untitled Article*. <http://www.banktech.com/showarticle.jhtml?articleID=187003126>, "Are you Winning in the Payment World?" dated May 1, 2006, (4 pgs).

BankServ, "DepositNow: What's the difference?" Cited in patent No. 7,970,677, as dated 2006, (4 pgs).

BankServ, *Product Overview*, <http://www.bankserv.com/products/remotedeposit.htm>, Cited in patent No. 7,970,677, as dated 2006, (3 pgs).

Blafore, Bonnie "Lower Commissions, Fewer Amenities", *Better Investing*, *Madison Heights*: Feb. 2003, vol. 52, Iss 6, (4 pgs).

BLM Technologies, "Case Study: Addressing Check 21 and RDC Error and Fraud Threats," *Remote Deposit Capture News Articles* from Jun. 11, 2007, Retrieved from http://www.remotedepositcapture.com/News/june_11_2007.htm on Feb. 18, 2008 (5 pgs).

Blue Mountain Consulting, from URL: www.bluemountainconsulting.com, Cited in patent No. 7,900,822, as dated Apr. 26, 2006 (3 pgs).

Board of Governors of the federal reserve system, "Report to the Congress on the Check Clearing for the 21st Century Act of 2003", Submitted to Congress pursuant to section 16 of the Check Clearing for the 21st Century Act of 2003, dated Apr. 2007, (59 pgs).

Bruene, Jim; "Check Free to Enable In-Home Remote Check Deposit for Consumers and Small Business", *NetBanker. Com*, *Financial-*

- Insite, Inc., http://www.netbanker.com/2008/02/checkfree_to_enableinhome_rem.html, Feb. 5, 2008 (3 pgs).
- Bruene, Jim; "Digital Federal Credit Union and Four Others Offer Consumer Remote Deposit Capture Through EasCorp", NetBanker—Tracking Online Finance, www.netbanker.com/2008/04/digital_federal_credit_union_a.html, Apr. 13, 2008 (3 pgs).
- Burnett, J. "Depository Bank Endorsement Requirements," BankersOnline.com, <http://www.bankersonline.com/cgi-bin/printview/printview.pl>, Jan. 6, 2003 (3 pgs).
- Canon, ImageFormula CR-25/CR-55, "Improve Your Bottom Line with Front-Line Efficiencies", 0117W117, 1207-55/25-1 OM-BSP, Cited in U.S. Pat. No. 7,949,587 as dated 2007. (4 pgs).
- Century Remote Deposit High-Speed Scanner User's Manual Release, 2006 (Century Manual) (32 pgs).
- Chiang, Chuck, The Bulletin, "Remote banking offered", <http://bendbulletin.com/apps/pbcs.dll/article?AID=/20060201/BIZ0102/602010327&templ...>, dated Feb. 1, 2006, (2 pgs).
- CNN.com/technology, "Scan, deposit checks from home", www.cnn.com/2008/TECH/biztech/02/07/check.scanning.ap/index.html, Feb. 7, 2008 (3 pgs).
- Constanzo, Chris, "Remote Check Deposit: Wells Captures a New Checking Twist", Bank Technology News Article—May 2005, www.americanbanker.com/btn_article.html?id=20050502YQ50FSYG (2 pgs).
- Craig, Ben, "Resisting Electronic Payment Systems: Burning Down the House?", Federal Reserve Bank of Cleveland, Jul. 1999 (4 pgs).
- Creativepaymentsolutions.com, "Creative Payment Solutions—Websolution," www.creativepaymentsolution.com/cps/financialservices/websolution/default.html, Copyright 2008, Creative Payment Solutions, Inc. (1 pg).
- Credit Union Journal, "The Ramifications of Remote Deposit Capture Success", www.cuijournal.com/orinthis.html?id=20080411EODZT57G, Apr. 14, 2008 (1 pg).
- Credit Union Journal, "AFCU Averaging 80 DepositHome Transactions Per Day", Credit Union Journal, Aug. 15, 2005 (1 pg).
- DCU Member's Monthly—Jan. 2008, "PC Deposit—Deposit Checks from Home!", http://www.mycreditunionnewsletter.com/decu/01_08/page1.html, Copyright 2008 Digital Federal Credit Union (2 pgs).
- De Queiroz, Ricardo et al., "Mixed Raster Content (MRC) Model for Compound Image Compression", 1998 (14 pgs).
- Debello, James et al., "RDM and Mitek Systems to Provide Mobile Check Deposit," Mitek Systems, Inc., San Diego, California and Waterloo, Ontario, (Feb. 24, 2009) (2 pgs).
- DeYoung, Robert; "The Financial Performance of Pure Play Internet Banks"; Federal Reserve Bank of Chicago Economic Perspectives; 2001; pp. 60-75; vol. 25, No. 1 (16 pgs).
- Dias, Danilo et al., "A Model for the Electronic Representation of Bank Checks", Brasilia Univ. Oct. 2006 (5 pgs).
- Digital Transactions News, "An ACH-Image Proposal for Check Roils Banks and Networks" May 26, 2006 (3 pgs).
- Dinan, R.F. et al., "Image Plus High Performance Transaction System", IBM Systems Journal, 1990 vol. 29, No. 3 (14 pgs).
- eCU Technologies, "Upост Remote Deposit Solution," Retrieved from the internet <https://www.eutechnologies.com/products/upost.html>, downloaded 2009 (1 pg).
- ElectronicPaymentProviders, Inc., "FAQs: ACH/ARC, CheckVerification/Conversion/Guarantee, RCK Check Re-Presentation," <http://www.useapp.com/faq.htm>, downloaded Oct. 18, 2006 (3 pgs).
- Federal Check 21 Act, "New Check 21 Act effective Oct. 28, 2004: Bank No Longer Will Return Original Cancelled Checks," Consumer Union's FAQ's and Congressional Testimony on Check 21, www.consumerlaw.org/initiatives/content/check21_content.html, Cited in patent No. 7,873,200, as dated Dec. 2005 (20 pgs).
- Federal Reserve Board, "Check Clearing for the 21st Century Act", FRB, <http://www.federalreserve.gov/paymentsystems/truncation/>, Mar. 1, 2006 (1 pg).
- Fest, Glen., "Patently Unaware" Bank Technology News, Apr. 2006, Retrieved from the internet at URL:<http://banktechnews.com/article.html?id=2006403T7612618> (5 pgs).
- Fisher, Dan M., "Home Banking in the 21st Century: Remote Capture Has Gone Retail", May 2008 (4 pgs).
- Furst, Karen et al., "Internet Banking: Developments and Prospects", Economic and Policy Analysis Working Paper 2000-9, Sep. 2000 (60 pgs).
- German Shegalov, Diplom-Informatiker, "Integrated Data, Message, and Process Recovery for Failure Masking in Web Services", Dissertation Jul. 2005 (146 pgs).
- Gupta, Amar et al., "An Integrated Architecture for Recognition of Totally Unconstrained Handwritten Numerals", WP#3765, Jan. 1993, Productivity from Information Technology "Profit" Research Initiative Sloan School of Management (20 pgs).
- Gupta, Maya R. et al., "OCR binarization and image pre-processing for searching historical documents," Pattern Recognition, vol. 40, No. 2, Feb. 2007, pp. 389-397.
- Hartly, Thomas, "Banks Check Out New Image", Business First, Buffalo: Jul. 19, 2004, vol. 20, Issue 43, (3 pgs).
- Heckenberg, D. "Using Mac OS X for Real-Time Image Processing" Oct. 8, 2003 (15 pgs).
- Hildebrad, C. et al., "Electronic Money," Oracle, <http://www.oracle.com/oramag/profit/05-feb/p15financial.html>, 2005, downloaded Oct. 18, 2006 (5 pgs).
- Hillebrand, G., "Questions and Answers About the Check Clearing for the 21st Century Act, Check 21," ConsumersUnion.org, <http://www.consumersunion.org/finance/ckclear1002.htm>, Jul. 27, 2004, downloaded Oct. 18, 2006 (6 pgs).
- Image Master, "Photo Restoration: We specialize in digital photo restoration and photograph repair of family pictures", <http://www.imphotorepair.com>, Cited in patent No. 7,900,822, as downloaded Apr. 2007 (1 pg).
- JBC: "What is a MICR Line," eHow.com, as downloaded May 4, 2009, (2 pgs).
- Johnson, Jennifer J., Secretary of the Board; Federal Reserve System, 12 CFR Part 229, Regulation CC; "Availability of Funds and Collection of Checks". Cited in patent No. 7,900,822, as dated 2009, (89 pgs).
- Kendrick, Kevin B., "Check Kidding, Float for Purposes of Profit," Bank Security & Fraud Prevention, vol. 1, No. 2, 1994 (3 pgs).
- Kiser, Elizabeth K.; "Modeling the Whole Firm: The Effect of Multiple Inputs and Financial Intermediation on Bank Deposit Rates," FEDS Working Paper No. 2004-07; Jun. 3, 2003; pp. 1-46 (46 pgs).
- Knestout, Brian P. et al., "Banking Made Easy" Kiplinger's Personal Finance Washington, Jul. 2003, vol. 57, Iss 7 (5 pgs).
- Kornai Andras et al., "Recognition of Cursive Writing on Personal Checks", Proceedings of International Workshop on the Frontiers in Handwriting Recognition, Cited in patent No. 7,900,822, as dated Sep. 1996, (6 pgs).
- Levitin, Adam J., Remote Deposit Capture: A Legal and Transactional Overview, Banking Law Journal, p. 115, 2009 (RDC) (8 pgs).
- Masonson, L., "Check Truncation and ACH Trends—Automated Clearing Houses", healthcare financial management associate, http://www.findarticles.com/p/articles/mLm3276/is_n7_v47/ai_14466034/print, 1993 (2 pgs).
- Matthews, Deborah, "Advanced Technology Makes Remote Deposit Capture Less Risky," Indiana Bankers Association, Apr. 2008 (2 pgs).
- Metro 1 Credit Union, "Remote Banking Services," <http://www.metro1cu.org/metro1cu/remotedeposit.html>, downloaded Apr. 17, 2007 (4 pgs).
- Mitek systems, "Imagenet Mobile Deposit", San Diego, CA, downloaded 2009 (2 pgs).
- Mitek Systems: Mitek Systems Launches First Mobile Check Deposit and Bill Pay Application, San Diego, CA, Jan. 22, 2008 (3 pgs).
- Mohl, Bruce, "Banks Reimbursing ATM Fee to Compete With Larger Rivals", Boston Globe, Boston, MA, Sep. 19, 2004 (3 pgs).
- Nelson, B. et al., "Remote deposit capture changes the retail landscape," Northwestern Financial Review, http://findarticles.com/p/articles/mi_qa3799/is_200607/ai_n16537250, 2006 (3 pgs).
- NetDeposit Awarded Two Patents for Electronic Check Process, Jun. 18, 2007 (NetDeposit) (1 pg).
- Nixon, Julie et al., "Fiserv Research Finds Banks are Interested in Offering Mobile Deposit Capture as an," Fiserv, Inc. Brookfield, Wis., (Business Wire), (Feb. 20, 2009) (2 pgs).
- Online Deposit: Frequently Asked Questions, <http://www.depositnow.com/faq.html>, Copyright 2008 (1 pg).

- Onlinecheck.com/Merchant Advisors, "Real-Time Check Debit", Merchant Advisors: Retail Check Processing Check Conversion, <http://www.onlinecheck/wach/rcareal.htm>, Cited in patent No. 7,900,822, as dated 2006 (3 pgs).
- Oxley, Michael G., from committee on Financial Services; "Check Clearing for the 21st Century Act", 108th Congress, 1st Session House of Representatives report 108-132, Jun. 2003 (20 pgs).
- Oxley, Michael G., from the committee of conference; "Check Clearing for the 21st Century Act" 108th Congress, 1st Session Senate report 108-291, Oct. 1, 2003 (27 pgs).
- Palacios, Rafael et al., "Automatic Processing of Brazilian Bank Checks". Cited in patent No. 7,900,822, as dated 2002 (28 pgs).
- Patterson, Scott "USAA Deposit@Home—Another WOW moment for Net Banking", NextCU.com, Jan. 26, 2007 (5 pgs).
- Public Law 108-100, 108 Congress; "An Act Check Clearing for the 21st Century Act", Oct. 28, 2003, 117 STAT. 1177 (18 pgs).
- Rao, Bharat; "The Internet and the Revolution in Distribution: A Cross-Industry Examination"; Technology in Society; 1999; pp. 287-306; vol. 21, No. 3 (20 pgs).
- Remotedepositcapture, URL: www.remotedepositcapture.com, Cited in patent No. 7,900,822, as dated 2006 (5 pgs).
- Remotedepositcapture.com, "PNC Bank to Offer Ease of Online Deposit Service Integrated with QuickBooks to Small Businesses", Remote Deposit Capture News Articles from Jul. 24, 2006, (2 pgs).
- Remotedepositcapture.com, Remote Deposit Capture News Articles from Jul. 6, 2006, "BankServ Announces New Remote Deposit Product Integrated with QuickBooks" (3 pgs).
- Remotedepositcapture.com, LLC, "Remote Deposit Capture Overview," ROC Overview, http://remotedepositcapture.com/overview/RDC_overview.htm, Cited in patent No. 7,900,822, as dated Mar. 12, 2007 (4 pgs).
- Ritzer, J.R. "Hinky Dinky helped spearhead POS, remote banking movement", Bank Systems and Equipment, vol. 21, No. 12, Dec. 1984 (1 pg).
- Rivlin, Alice M. et al., Chair, Vice Chair—Board of Governors, Committee on the Federal Reserve in the Payments Mechanism—Federal Reserve System, "The Federal Reserve in the Payments Mechanism", Jan. 1998 (41 pgs).
- Rose, Sarah et al., "Best of the We: The Top 50 Financial Websites", Money, New York, Dec. 1999, vol. 28, Iss. 12 (8 pgs).
- Shelby, Hon. Richard C. (Committee on Banking, Housing and Urban Affairs); "Check Truncation Act of 2003"; calendar No. 168, 108th Congress, 1st Session Senate report 108-79, Jun. 2003 (27 pgs).
- Thailandguru.com: How and where to Pay Bills @ www.thailandguru.com/paying-bills.html, as downloaded Nov. 16, 2010, (2 pgs).
- The Automated Clearinghouse, "Retail Payment Systems; Payment Instruments Clearing and Settlement: The Automated Clearinghouse (ACH)", www.ffiec.gov/ffiecinfobase/booklets/retailretail_02d.html, Cited in patent No. 7,900,822, as dated Dec. 2005 (3 pgs).
- The Green Sheet 2.0: Newswire, "CO-OP adds home deposit capabilities to suite of check imaging products", www.greensheet.com/newswire.php?newswire_id=8799, Mar. 5, 2008 (2 pgs).
- Tygar, J.D., Atomicity in Electronic Commerce, In ACM Networker, 2:2, Apr./May 1998 (12 pgs).
- Valentine, Lisa, "Remote Deposit Capture Hot Just Got Hotter," ABA Banking Journal, Mar. 2006, p. 1-9.
- Wade, Will, "Early Notes: Updating Consumers on Check 21" American Banker Aug. 10, 2004 (3 pgs).
- Walliston, Peter J., "Wal-Mart Case Exposes Flaws in Banking-Commerce Split", American Banker, vol. 167, No. 8, Jan. 11, 2002 (3 pgs).
- Wells Fargo 2005 News Releases, "The New Wells Fargo Electronic Deposit Services Break Through Banking Boundaries in the Age of Check 21", San Francisco Mar. 28, 2005, www.wellsfargo.com/press/3282005_check21Year=2005 (1 pg).
- Wells Fargo Commercial, "Remote Deposit", www.wellsfargo.com/com/treasury_mgmt/treceivables/electronic/remote_deposit, Copyright 2008 (1 pg).
- White, J.M. et al., "Image Thresholding for Optical Character Recognition and Other Applications Requiring Character Image Extraction", IBM J. RES. Development, Jul. 1983, vol. 27, No. 4 (12 pgs).
- Whitney et al., "Reserve Banks to Adopt DSTU X9.37-2003 Format for Check 21 Image Services", American Bankers Association, May 18, 2004, http://www.aba.com/NR/rdonlyres/CBDC1_A5C-43E3-43CC-B733-BE417C638618/35930/DSTUFormat.pdf (2 pgs).
- Wikipedia®, "Remote Deposit," http://en.wikipedia.org/wiki/Remote_deposit, 2007 (3 pgs).
- Windowsfordevices.com, "Software lets camera phone users deposit checks, pay bills", www.windowsfordevices.com/news/NS3934956670.html, Jan. 29, 2008 (3 pgs).
- Woody Baird Associated Press, "Pastors Wife got Scammed—She Apparently Fell for Overseas Money Scheme," The Commercial Appeal, Jul. 1, 2006, p. A. 1.
- Zhang, C.Y., "Robust Estimation and Image Combining" Astronomical Data Analysis Software and Systems IV, ASP Conference Series, 1995 (5 pgs).
- Zions Bancorporation, "Moneytech, the technology of money in our world: Remote Deposit," http://www.bankjunior.com/pground/moneytech/remote_deposit.jsp, 2007 (2 pgs).
- Office Action from corresponding U.S. Appl. No. 11/931,945 dated Apr. 1, 2011 (18 pgs).
- Office Action from corresponding U.S. Appl. No. 11/931,804 dated Apr. 5, 2011 (15 pgs).
- Final Office Action from corresponding U.S. Appl. No. 11/931,804 dated Jan. 4, 2012 (14 pgs).
- Amber Avalona-Butler / Paraglide, "At Your Service: Best iPhone Apps for Military Lifestyle," Jul. 9, 2010 (2 pgs).
- Bruno, M., "Instant Messaging," Bank Technology News, Dec. 2002 (3 pgs).
- Carrubba, P. et al., "Remote Deposit Capture: A White Paper Addressing Regulatory, Operational and Risk Issues," NetDeposit Inc., 2006 (11 pgs).
- De Jesus, A. et al., "Distributed Check Processing in a Check 21 Environment: An educational overview of the opportunities and challenges associated with implementing distributed check imaging and processing solutions," Panini, 2004, pp. 1-22.
- EFT Network Unveils FAXtellerPlus, EFT Network, Inc., www.eftnetwork.com, Jan. 13, 2009 (2 pgs).
- Federal Reserve System, "12 CFR, Part 229 [Regulation CC; Docket No. R-0926]: Availability of Funds and Collection of Checks," Federal Registrar, Apr. 28, 1997, pp. 1-50.
- Federal Reserve System, "Part IV, 12 CFR Part 229 [Regulation CC; Docket No. R-1176]: Availability of Funds and Collection of Checks; Final Rule," Federal Registrar, vol. 69, No. 149, Aug. 4, 2004, pp. 47290-47328.
- Fidelity Information Services, "Strategic Vision Embraces Major Changes in Financial Services Solutions: Fidelity's long-term product strategy ushers in new era of application design and processing," Insight, 2004, pp. 1-14.
- Garry, M., "Checking Options: Retailers face an evolving landscape for electronic check processing that will require them to choose among several scenarios," Supermarket News, vol. 53, No. 49, 2005 (3 pgs).
- Investment Systems Company, "Portfolio Accounting System," 2000, pp. 1-32.
- Moreau, T., "Payment by Authenticated Facsimile Transmission: a Check Replacement Technology for Small and Medium Enterprises," Connotech Experts-conseils, Inc., Apr. 1995 (31 pgs).
- NetBank, Inc., "Branch Out: Annual Report 2004," 2004 (150 pgs).
- NetBank, Inc., "Quick Post: Deposit and Payment Forwarding Service," 2005 (1 pg).
- Richey, J. C. et al., "EE 4530 Check Imaging," Nov. 18, 2008 (10 pgs).
- SoyBank Anywhere, "Consumer Internet Banking Service Agreement," Dec. 6, 2004 (6 pgs).
- Teixeira, D., "Comment: Time to Overhaul Deposit Processing Systems," American Banker, Dec. 10, 1998, vol. 163, No. 235, p. 15 (3 pgs).
- Wolfe, Daniel, "Check Image Group Outlines Agenda," American Banker, New York, N.Y.: Feb 13, 2009, vol. 174, Iss. 30, p. 12. (2 pgs).
- Application as filed on Apr. 3, 2008 for U.S. Appl. No. 12/062,143 (27 pgs).
- Application as filed on Aug. 19, 2010 for U.S. Appl. No. 12/859,741 (235 pgs).

Application as filed on Aug. 21, 2008 for U.S. Appl. No. 12/195,723 (38 pgs).
Application as filed on Aug. 21, 2009 for U.S. Appl. No. 12/545,127 (45 pgs).
Application as filed on Aug. 28, 2009 for U.S. Appl. No. 12/549,443 (41 pgs).
Application as filed on Dec. 20, 2006 for U.S. Appl. No. 11/613,656 (21 pgs).
Application as filed on Dec. 30, 2010 for U.S. Appl. No. 12/982,494 (280 pgs).
Application as filed on Dec. 30, 2010 for U.S. Appl. No. 12/982,561 (275 pgs).
Application as filed on Dec. 30, 2010 for U.S. Appl. No. 12/982,578 (274 pgs).
Application as filed on Dec. 30, 2010 for U.S. Appl. No. 12/982,594 (275 pgs).
Application as filed on Feb. 18, 2009 for U.S. Appl. No. 12/388,005 (37 pgs).
Application as filed on Jul. 13, 2006 for U.S. Appl. No. 11/487,537 (23 pgs).
Application as filed on Jul. 27, 2009 for U.S. Appl. No. 12/509,613 (48 pgs).
Application as filed on Jul. 27, 2009 for U.S. Appl. No. 12/509,680 (41 pgs).
Application as filed on Jun. 11, 2008 for U.S. Appl. No. 12/137,051 (29 pgs).
Application as filed on Jun. 8, 2011 for U.S. Appl. No. 13/155,976 (352 pgs).
Application as filed on Jun. 8, 2011 for U.S. Appl. No. 13/156,007 (356 pgs).
Application as filed on Jun. 8, 2011 for U.S. Appl. No. 13/156,018 (353 pgs).
Application as filed on Mar. 15, 2007 for U.S. Appl. No. 11/686,924 (34 pgs).
Application as filed on Mar. 15, 2007 for U.S. Appl. No. 11/686,928 (36 pgs).
Application as filed on Mar. 4, 2009 for U.S. Appl. No. 12/397,671 (40 pgs).
Application as filed on Mar. 4, 2009 for U.S. Appl. No. 12/397,930 (37 pgs).
Application as filed on May 10, 2007 for U.S. Appl. No. 11/747,222 (35 pgs).
Application as filed on Oct. 17, 2008 for U.S. Appl. No. 12/253,278 (42 pgs).
Application as filed on Oct. 23, 2007 for U.S. Appl. No. 11/876,925 (36 pgs).
Application as filed on Oct. 23, 2007 for U.S. Appl. No. 11/877,335 (29 pgs).
Application as filed on Oct. 25, 2007 for U.S. Appl. No. 11/923,839 (22 pgs).
Application as filed on Oct. 29, 2007 for U.S. Appl. No. 11/926,388 (23 pgs).
Application as filed on Oct. 30, 2007 for U.S. Appl. No. 11/928,297 (26 pgs).
Application as filed on Oct. 31, 2006 for U.S. Appl. No. 11/590,974 (31 pgs).
Application as filed on Oct. 31, 2006 for U.S. Appl. No. 11/591,008 (27 pgs).
Application as filed on Oct. 31, 2006 for U.S. Appl. No. 11/591,227 (58 pgs).

Application as filed on Oct. 31, 2006 for U.S. Appl. No. 11/591,273 (56 pgs).
Application as filed on Oct. 31, 2007 for U.S. Appl. No. 11/930,537 (27 pgs).
Application as filed on Oct. 8, 2007 for U.S. Appl. No. 11/868,884 (30 pgs).
Application as filed on Sep. 28, 2007 for U.S. Appl. No. 11/864,569 (35 pgs).
Application as filed on Sep. 8, 2008 for U.S. Appl. No. 12/205,996 (30 pgs).
Claims as filed on Apr. 3, 2008 for U.S. Appl. No. 12/062,163 (3 pgs).
Claims as filed on Apr. 3, 2008 for U.S. Appl. No. 12/062,175 (3 pgs).
Claims as filed on Aug. 19, 2010 for U.S. Appl. No. 12/859,752 (5 pgs).
Claims as filed on Dec. 15, 2011 for U.S. Appl. No. 13/327,478 (4 pgs).
Claims as filed on Dec. 20, 2006 for U.S. Appl. No. 11/613,671 (3 pgs).
Claims as filed on Dec. 8, 2010 for U.S. Appl. No. 12/963,513 (7 pgs).
Claims as filed on Feb. 16, 2011 for U.S. Appl. No. 13/028,477 (3 pgs).
Claims as filed on Jan. 20, 2011 for U.S. Appl. No. 13/010,644 (9 pgs).
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Claims as filed on May 10, 2007 for U.S. Appl. No. 11/747,223 (4 pgs).
Claims as filed on May 18, 2011 for U.S. Appl. No. 13/110,077 (9 pgs).
Claims as filed on May 2, 2011 for U.S. Appl. No. 13/098,566 (10 pgs).
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Claims as filed on Oct. 24, 2008 for U.S. Appl. No. 12/257,471 (4 pgs).
Claims as filed on Oct. 31, 2006 for U.S. Appl. No. 11/590,963 (3 pgs).
Claims as filed on Oct. 31, 2006 for U.S. Appl. No. 11/590,995 (3 pgs).
Claims as filed on Oct. 31, 2006 for U.S. Appl. No. 11/590,998 (4 pgs).
Claims as filed on Oct. 31, 2007 for U.S. Appl. No. 11/931,804 (4 pgs).
Claims as filed on Oct. 8, 2007 for U.S. Appl. No. 11/868,878 (4 pgs).
Claims as filed on Sep. 2, 2008 for U.S. Appl. No. 12/202,781 (4 pgs).
Claims as filed on Sep. 8, 2008 for U.S. Appl. No. 12/206,001 (3 pgs).
Claims as filed on Sep. 8, 2008 for U.S. Appl. No. 12/206,007 (3 pgs).
Notice of Allowance from corresponding U.S. Appl. No. 11/931,804 dated Jun. 22, 2012 (9 pgs).
Application as filed on Feb. 15, 2012 for U.S. Appl. No. 13/397,405 (19 pgs).
Claims as filed on Feb. 15, 2012 for U.S. Appl. No. 13/397,437 (6 pgs).
Claims as filed on Dec. 29, 2005 for U.S. Appl. No. 11/320,998 (3 pgs).
Claims as filed on Dec. 29, 2005 for U.S. Appl. No. 11/321,027 (3 pgs).

* cited by examiner

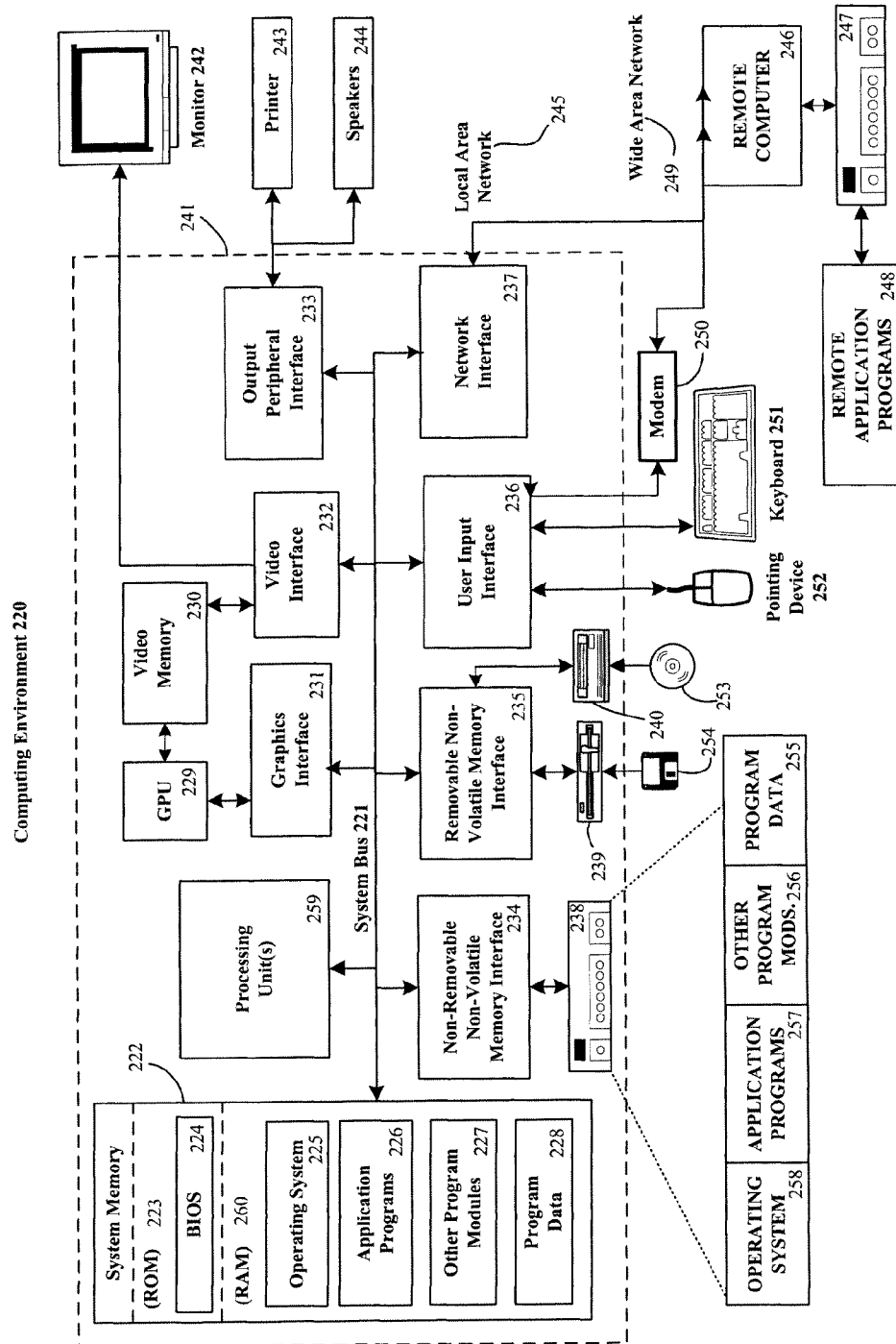
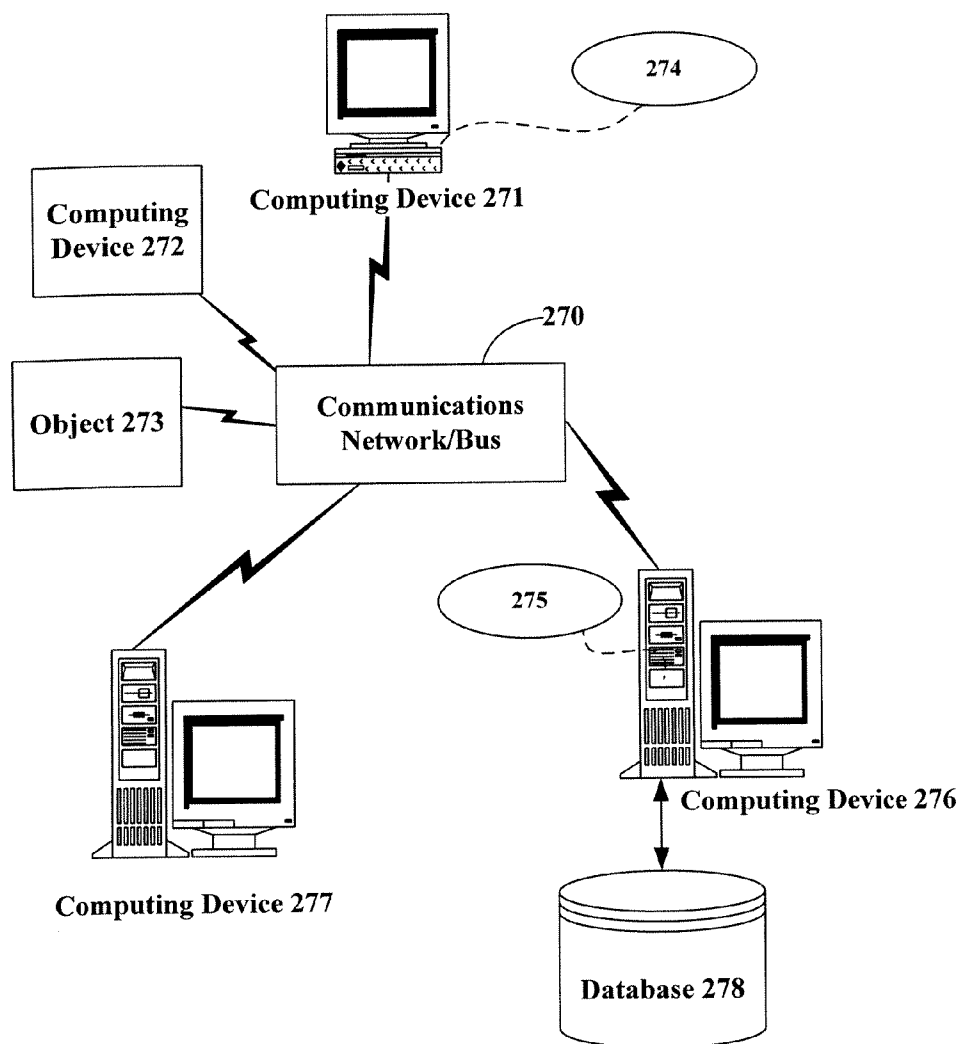


Fig. 1

**Fig. 2**

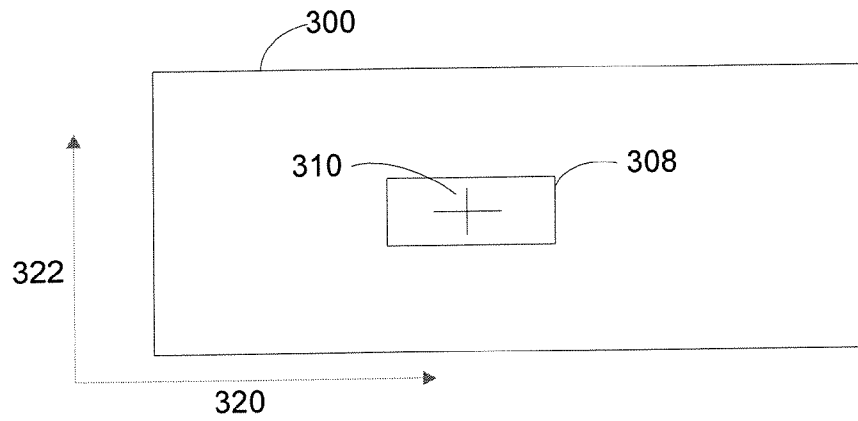


Fig. 3a

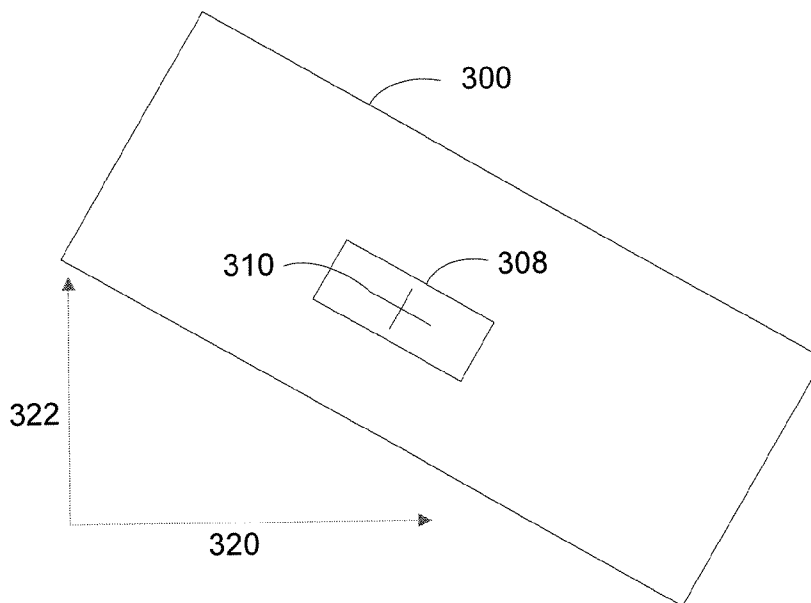


Fig. 3b

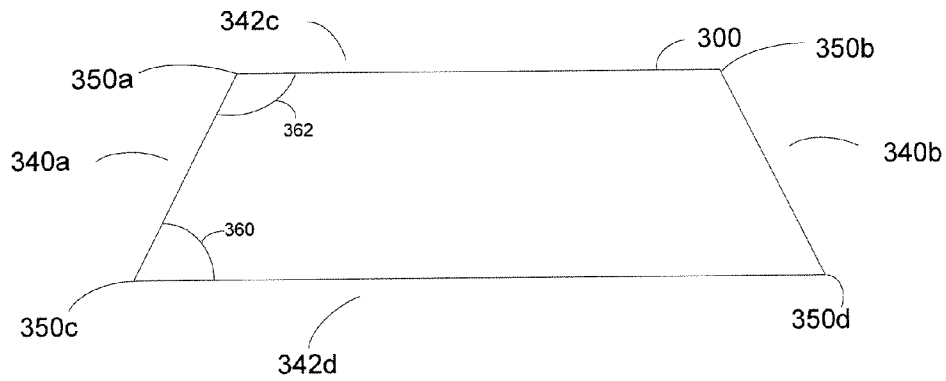


Fig. 3c

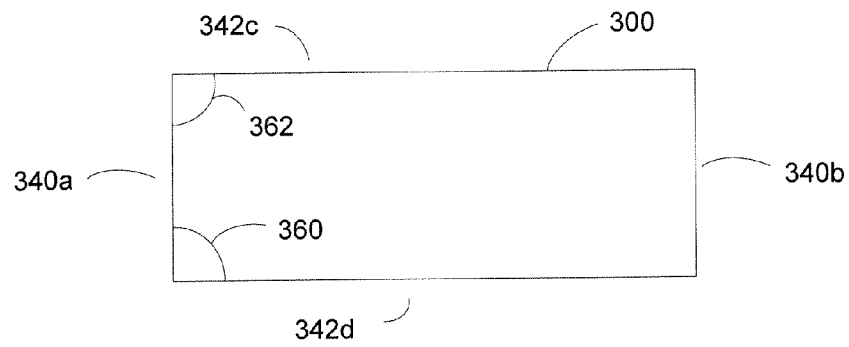


Fig. 3d

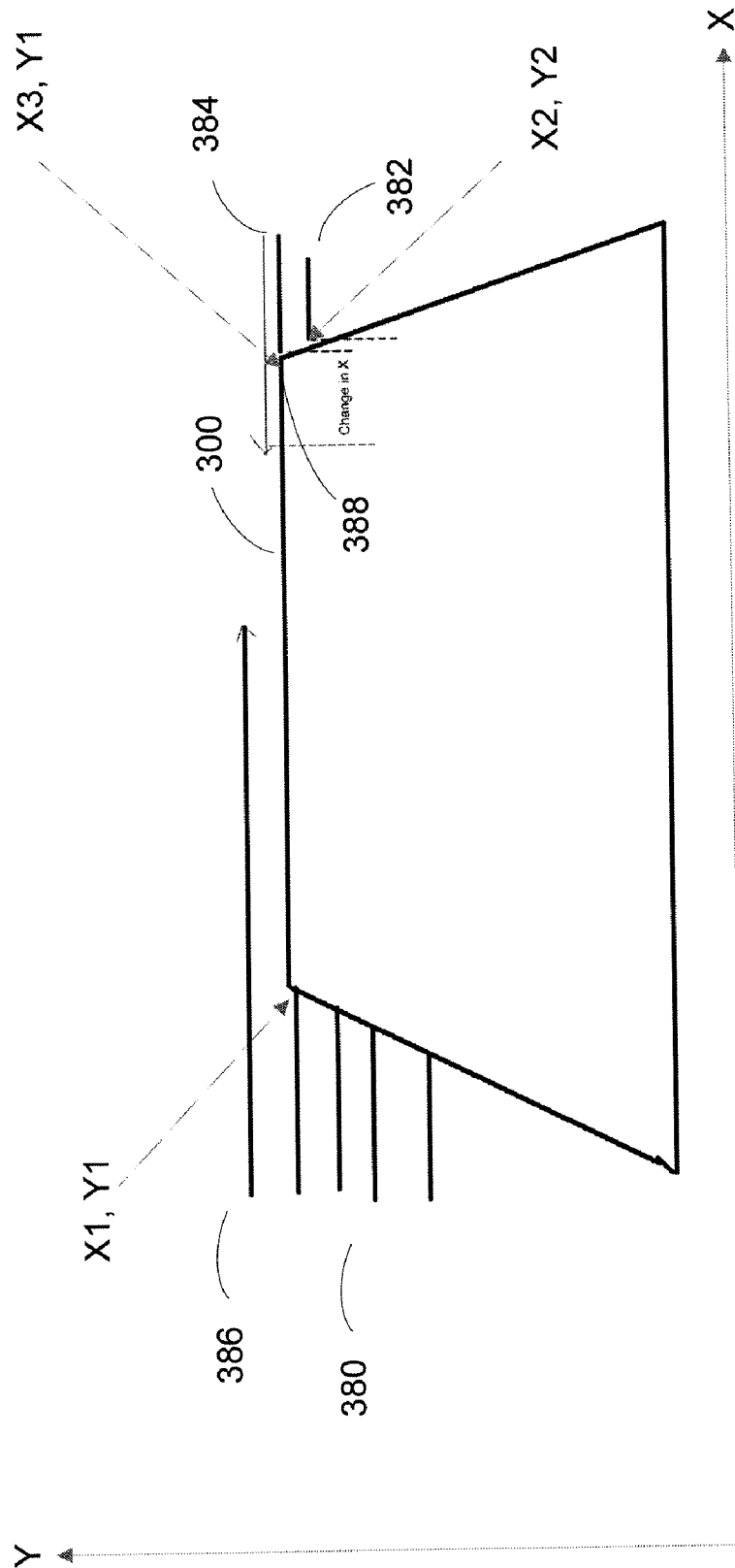


Fig. 3e

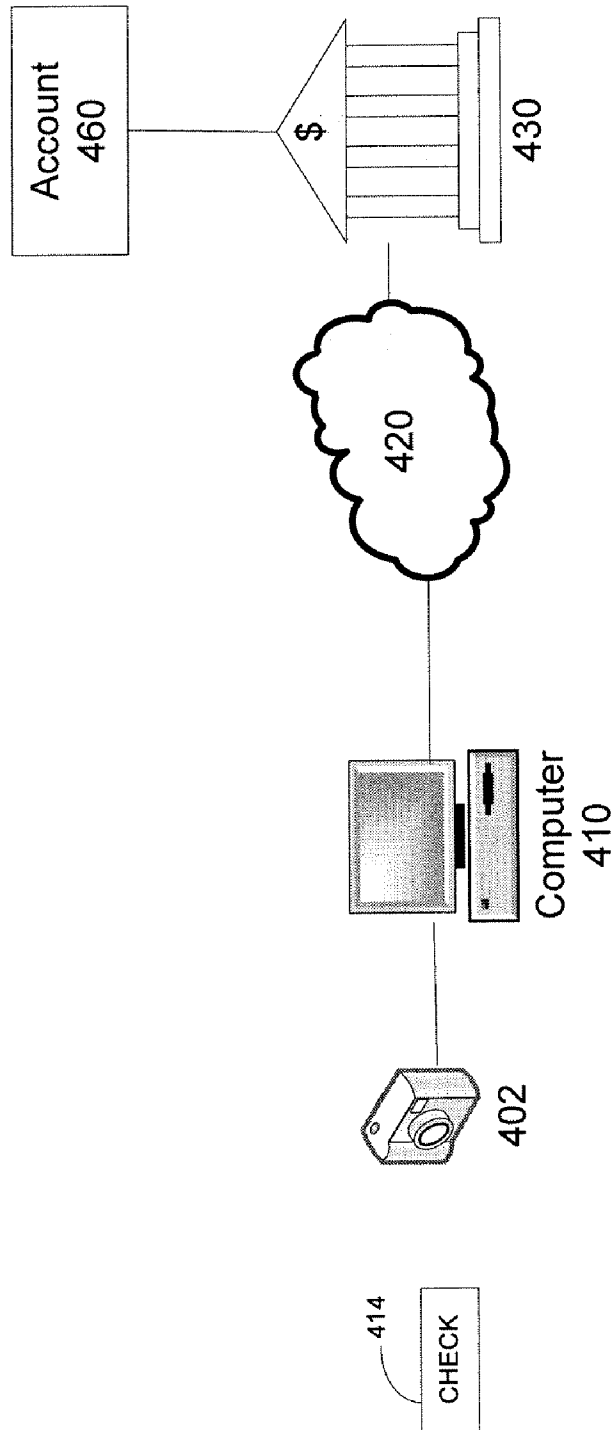


Fig. 4a

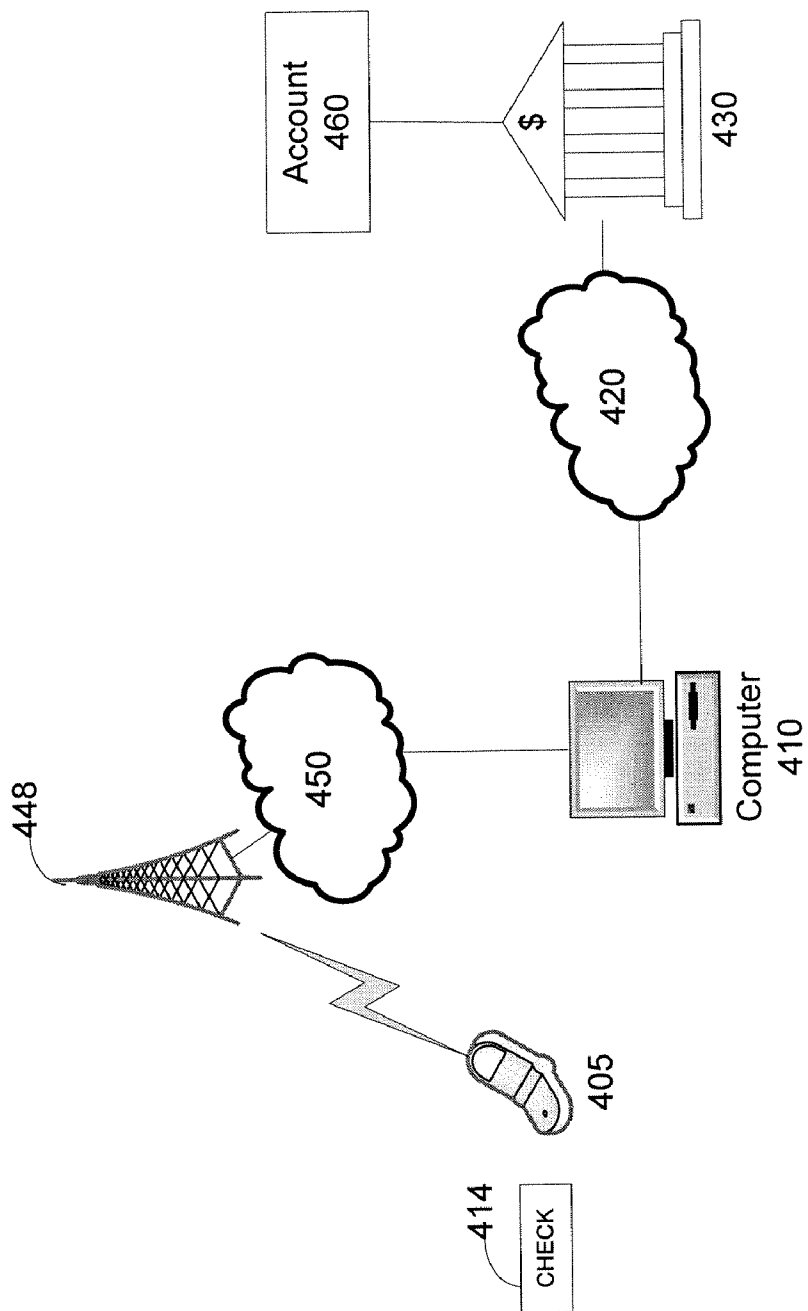
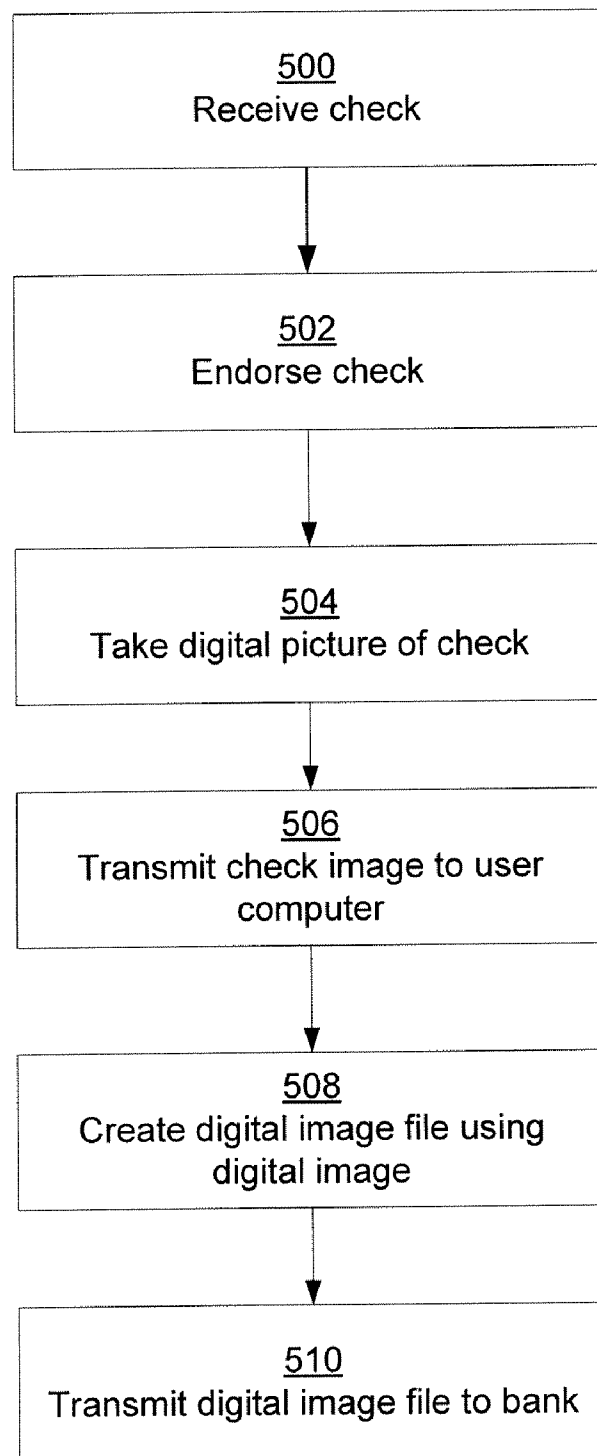
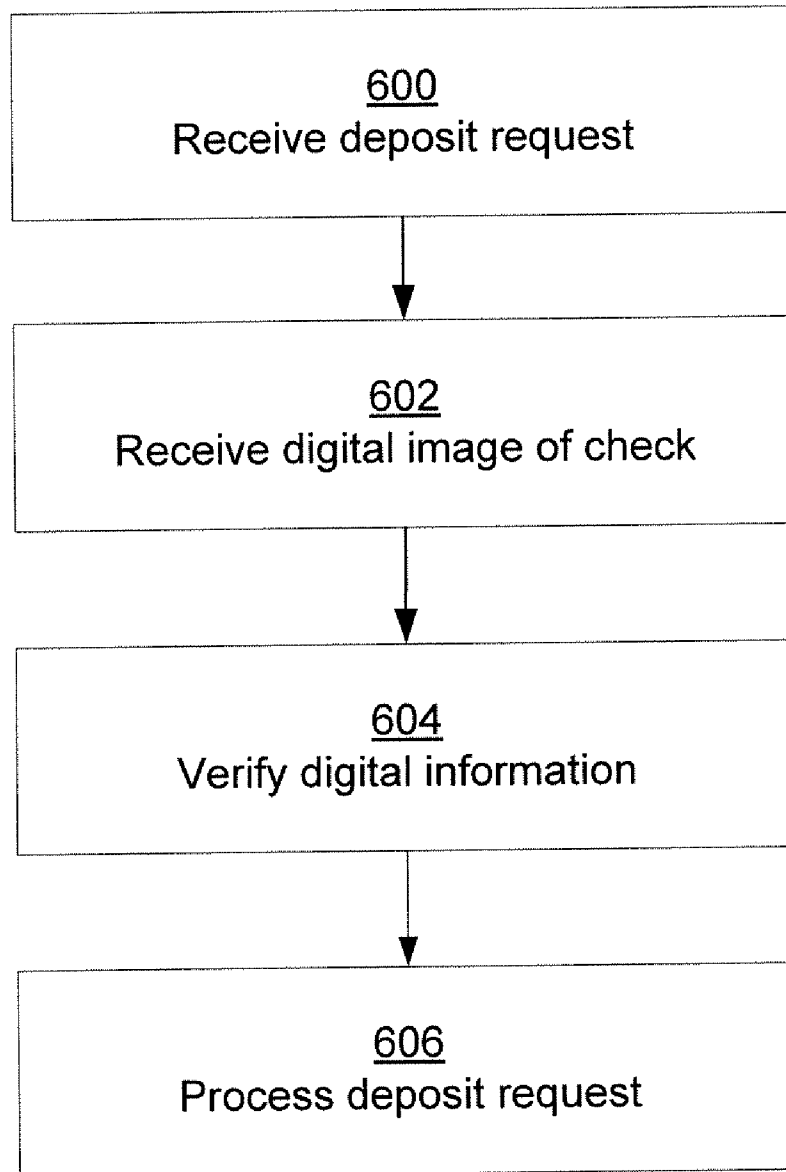


Fig. 4b

**Fig. 5**

**Fig. 6**

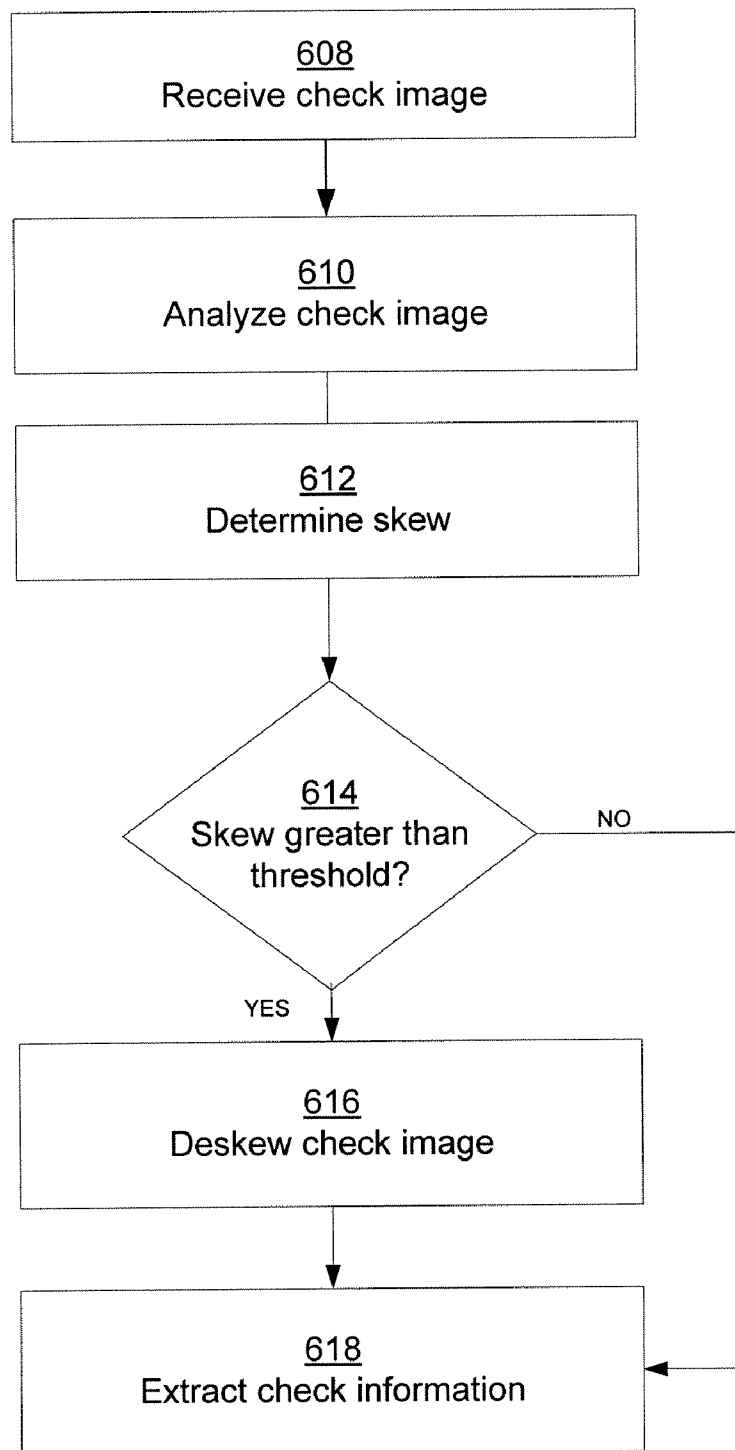


Fig. 6a

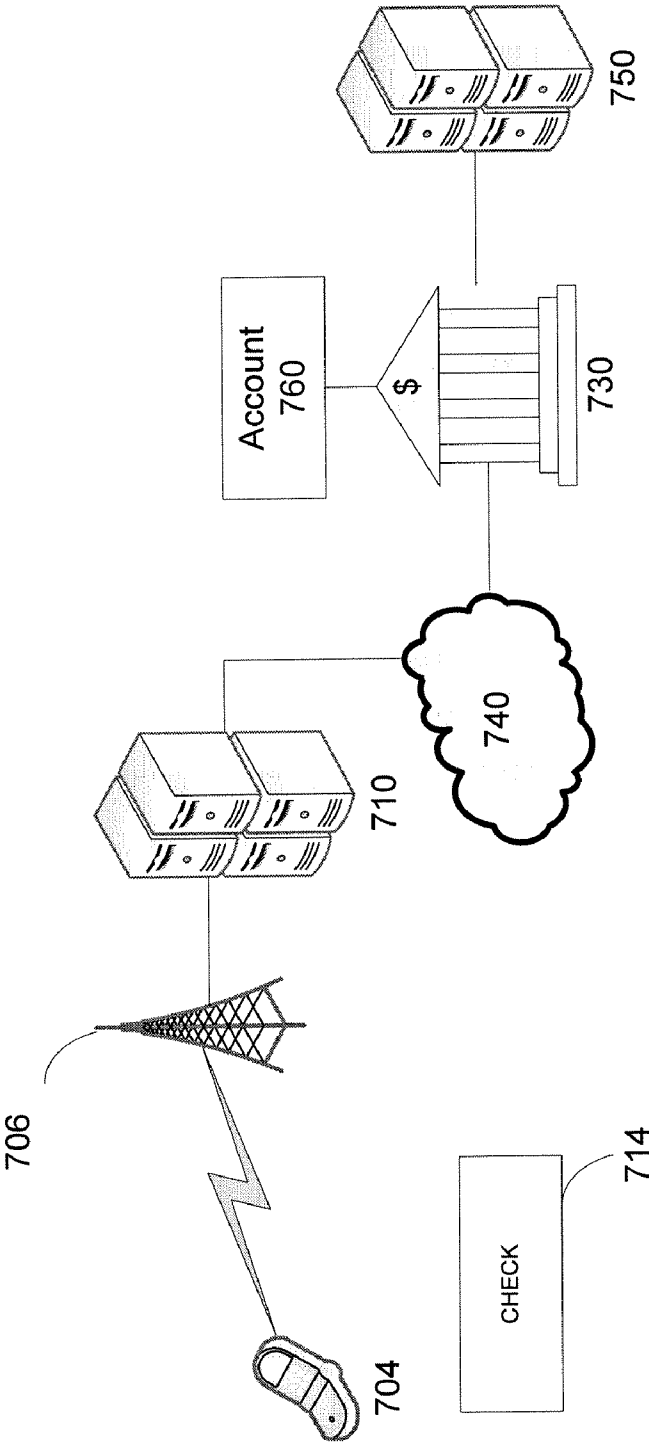


Fig. 7

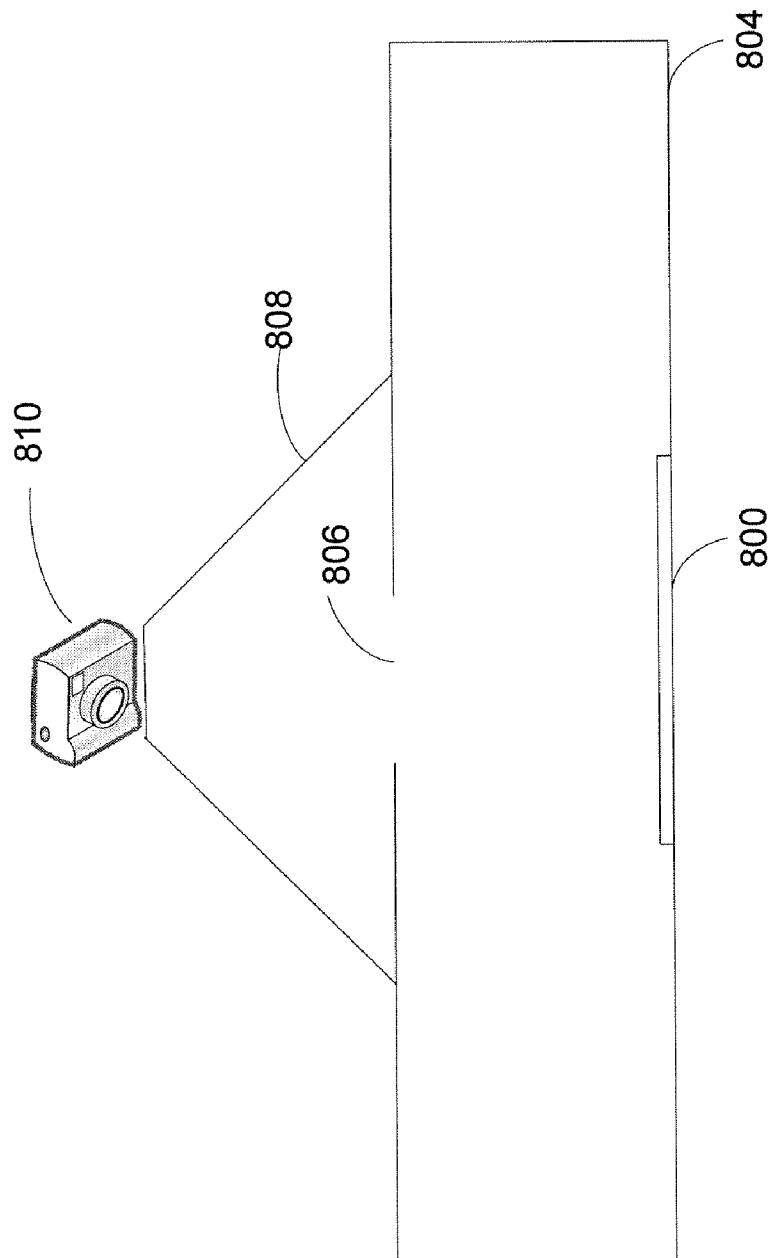


Fig. 8

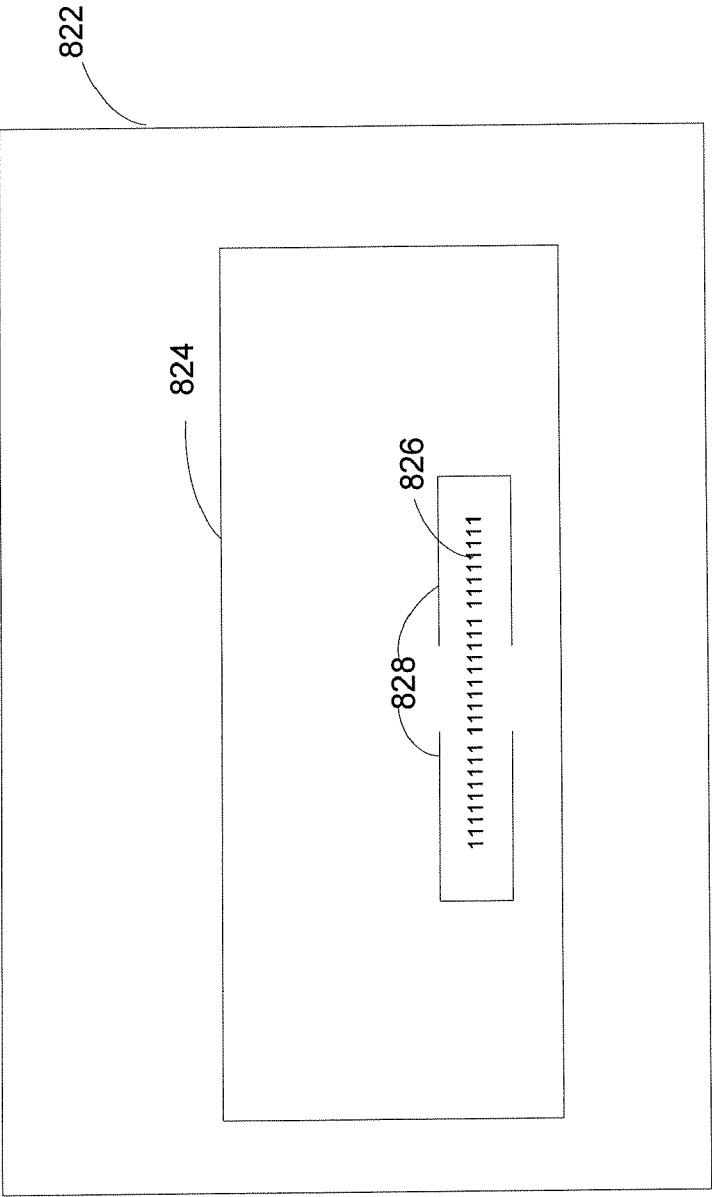


Fig. 8a

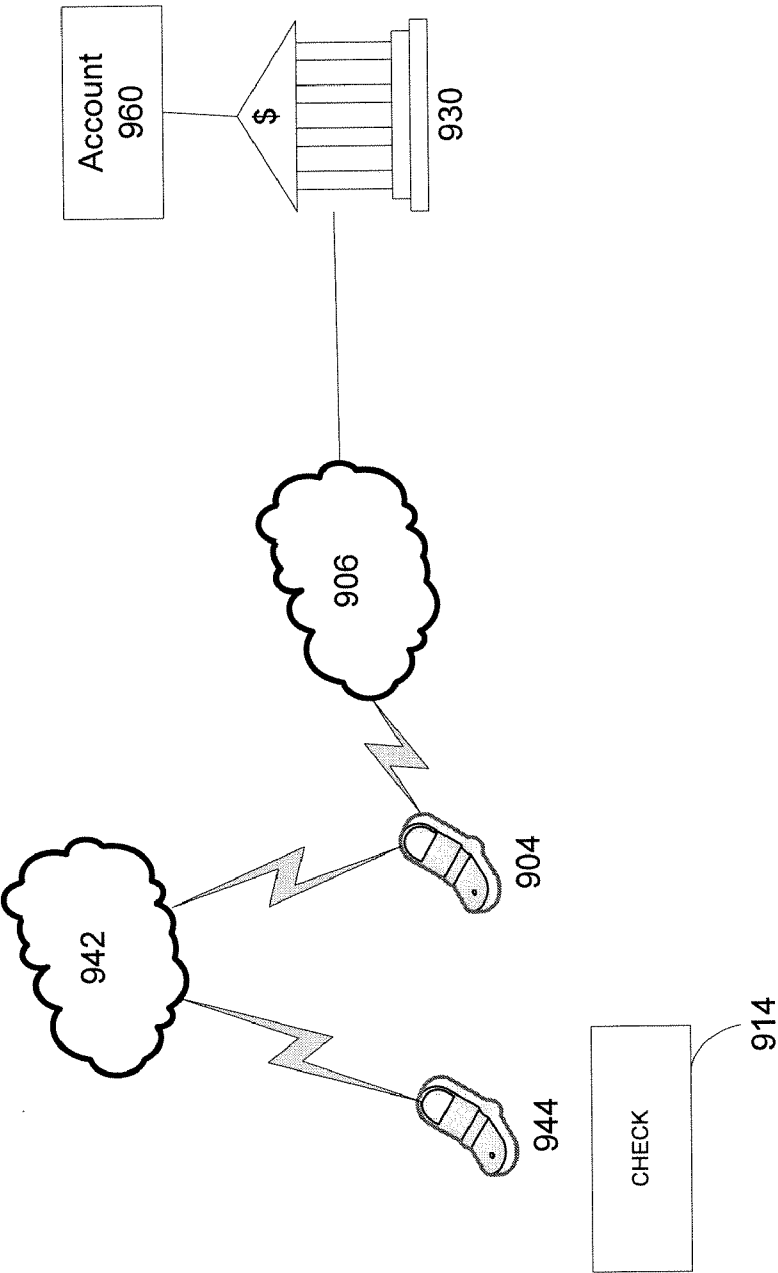
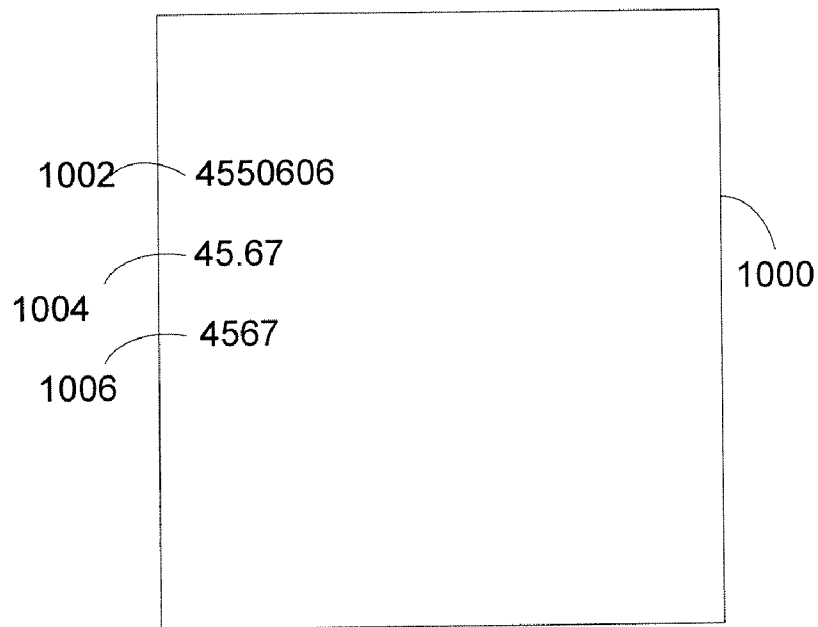


Fig. 9

**Fig. 10**

1

SYSTEMS AND METHODS TO USE A DIGITAL CAMERA TO REMOTELY DEPOSIT A NEGOTIABLE INSTRUMENT

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CROSS-REFERENCE TO RELATED APPLICATIONS

This application is related by subject matter to the subject matter disclosed in the following commonly assigned applications, the entirety of which are hereby incorporated by reference herein: U.S. patent application Ser. No. 11/931,804, and U.S. patent application Ser. No. 11/931,945, each filed on Oct. 31, 2007 and each entitled "Systems and Methods to Use a Digital Camera to Remotely Deposit a Negotiable Instrument."

BACKGROUND

Upon the passage of the Check Clearing for the 21st Century Act (Check 21), the use of digital images for check presentment has increased dramatically, as the process typically reduces the time necessary for a check to clear and the cost associated with moving paper checks from location to location. In lieu of using a physical check to clear the check clearinghouse, a scanned image is used in the process. A person, such as a bank teller, scans the physical check upon presentment by a customer at a bank. The scan creates a digital image of the check. The digital image, along with other electronic information such as amount and account holder, is submitted electronically to the federal check clearinghouse system. The system processes the digital image of the check rather than processing the physical check itself.

Banks and other institutions that may process checks have realized significant benefits by using electronic presentment of checks. Along with the reduction of the need to transport paper from the bank of presentment to the federal clearinghouse, a reduction in the processing time has also been realized. At issue when presenting checks electronically is the type of equipment available for use by the depositor and the communication capabilities of the depositor at the time of deposit. For example, a user that wishes to deposit a check by scanning the check and creating a digital image of the check may not have a scanner available for use. Even if a scanner is available for use, the user may not be able to configure their computer system to communicate information to a bank to deposit the check. Thus, the user may not be able to deposit a check, or other type of negotiable instrument, into their account.

SUMMARY

This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This summary is not intended to identify key features or essential features of the claimed sub-

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ject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

In consideration of the above-identified shortcomings of the art, the present subject matter addresses the shortcomings of the prior art and provides for additional benefits through the use of a digital camera to capture a digital image of the negotiable instrument, such as a check, for processing a deposit transaction. The digital camera may be used in lieu of a scanner for capturing an image of the negotiable instrument. The image may be modified to compensate for sub-optimal images. In one exemplary and non-limiting embodiment, a method for depositing funds of a negotiable instrument comprises taking a digital picture of the negotiable instrument, wherein a digital camera is used to take the digital picture. The digital camera then creates a digital image file containing the digital picture. The digital image file is then transmitted along with a request to deposit funds of the negotiable instrument.

In another exemplary and non-limiting embodiment, a method of depositing funds of a negotiable instrument comprises receiving a request to deposit funds of the negotiable instrument and receiving a digital image file of the negotiable instrument. The digital image file comprises a digital image of the negotiable instrument created using a digital camera. The funds from the negotiable instrument are then deposited. Another exemplary and non-limiting embodiment for extracting negotiable instrument information to deposit funds of the negotiable instrument comprises taking a picture of the negotiable instrument using a digital camera to create a digital image and then determining if the digital image is acceptable for use. Information is extracted from the digital image. A communication pathway is opened with a financial institution and the extracted information is transmitted along with the digital image and a request to deposit funds of the negotiable instrument.

Other features of the subject matter are described below.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing summary, as well as the following detailed description of the subject matter is better understood when read in conjunction with the appended drawings. For the purposes of illustration, there is shown in the drawings exemplary embodiments; however, these embodiments are not limited to the specific methods and instrumentalities disclosed. In the drawings:

FIG. 1 is a block diagram representing an exemplary and non-limiting computing device suitable for use in conjunction with the present subject matter;

FIG. 2 illustrates an exemplary and non-limiting networked computing environment in which many computerized processes may be implemented to provide the present subject matter;

FIG. 3a is an exemplary and non-limiting diagram illustrating an image of a negotiable instrument;

FIG. 3b is an exemplary and non-limiting diagram illustrating another image of a negotiable instrument;

FIG. 3c is an exemplary and non-limiting diagram illustrating a distorted image of a check;

FIG. 3d is an exemplary and non-limiting diagram illustrating an image in which the distortion of the image has been at least partially removed;

FIG. 3e is an exemplary and non-limiting diagram illustrating the determination of a corner of a distorted image to warp the image;

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FIG. 4a is an exemplary and non-limiting diagram illustrating a system for using a digital camera for capturing an image of a negotiable instrument;

FIG. 4b is an exemplary and non-limiting diagram illustrating a system for using a cellular phone with an integrated digital camera for capturing an image of a negotiable instrument;

FIG. 5 is an exemplary and non-limiting flow diagram illustrating the capture and submission of a digital image to a bank for deposit processing;

FIG. 6 is an exemplary and non-limiting flow diagram illustrating the receipt of a digital image for deposit processing;

FIG. 6a is an exemplary and non-limiting flow diagram illustrating a process for deskewing a digital image of a negotiable instrument;

FIG. 7 is an exemplary and non-limiting diagram illustrating the use of a cellular phone to transmit digital image information to a bank;

FIG. 8 is an exemplary and non-limiting apparatus for assisting a user to capture a digital image of a negotiable instrument;

FIG. 8a is an exemplary and non-limiting electronic alignment aid for assisting a user to capture a digital image of a negotiable instrument;

FIG. 9 is an exemplary and non-limiting system for using remote transmission of a digital image using a cellular phone; and

FIG. 10 is an exemplary and non-limiting screenshot of a text message for use in transmitting a digital image of a negotiable instrument.

DETAILED DESCRIPTION

Certain specific details are set forth in the following description and figures to provide a thorough understanding of various embodiments of the subject matter. Certain well-known details often associated with computing and software technology are not set forth in the following disclosure to avoid unnecessarily obscuring the various embodiments of the subject matter. Further, those of ordinary skill in the relevant art will understand that they can practice other embodiments of the subject matter without one or more of the details described below. Finally, while various methods are described with reference to steps and sequences in the following disclosure, the description as such is for providing a clear implementation of embodiments of the subject matter, and the steps and sequences of steps should not be taken as required to practice this subject matter.

Referring to FIG. 1, shown is a block diagram representing an exemplary computing environment suitable for use in conjunction with implementing the processes described below. For example, the computer executable instructions that carry out the processes and methods for providing the subject matter of the present disclosure may reside and/or be executed in such a computing environment as shown in FIG. 1. The computing system environment 220 is only one example of a suitable computing environment and is not intended to suggest any limitation as to the scope of use or functionality of the subject matter. Neither should the computing system environment 220 be interpreted as having any dependency or requirement relating to any one or combination of components illustrated in the exemplary computing system environment 220. For example a computer game console may also include items such as those described below for use in conjunction with implementing the processes described above.

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Aspects of the subject matter are operational with numerous other general purpose or special purpose computing system environments or configurations. Examples of well known computing systems, environments, and/or configurations that may be suitable for use with the subject matter include, but are not limited to, personal computers, server computers, handheld or laptop devices, multiprocessor systems, microprocessor-based systems, set-top boxes, programmable consumer electronics, network PCs, minicomputers, mainframe computers, distributed computing environments that include any of the above systems or devices, and the like.

Aspects of the subject matter may be implemented in the general context of computer-executable instructions, such as program modules, being executed by a computer. Generally, program modules include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types. Aspects of the subject matter may also be practiced in distributed computing environments where tasks are performed by remote processing devices that are linked through a communications network. In a distributed computing environment, program modules may be located in both local and remote computer storage media, including memory storage devices.

An exemplary system for implementing aspects of the subject matter includes a general purpose computing device in the form of a computer 241. Components of computer 241 may include, but are not limited to, a processing unit 259, a graphical processing unit 229 (GPU), a video memory 230, a graphics interface 231, a system memory 222, and a system bus 221 that couples various system components including the system memory 222 to the processing unit 259. The system bus 221 may be any of several types of bus structures, including a memory bus or memory controller, a peripheral bus, and a local bus, using any of a variety of bus architectures. By way of example and not limitation, such architectures include Industry Standard Architecture (ISA) bus, Micro Channel Architecture (MCA) bus, Enhanced ISA (EISA) bus, Video Electronics Standards Association (VESA) local bus, and Peripheral Component Interconnect (PCI) bus (also known as Mezzanine bus).

Computer 241 typically includes a variety of computer-readable media. Computer-readable media can be any available media that can be accessed by computer 241 and includes both volatile and non-volatile media, removable and non-removable media. By way of example and not limitation, computer-readable media may comprise computer-storage media and communication media. Computer-storage media includes both volatile and non-volatile, removable and non-removable media implemented in any method or technology for storage of information such as computer readable instructions, data structures, program modules or other data. Computer-storage media includes, but is not limited to, random access memory (RAM), read-only memory (ROM), Electrically Erasable Programmable Read-Only Memory (EEPROM), flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical disk storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium that can be used to store the desired information and that can be accessed by computer 241. Communication media typically embodies computer readable instructions, data structures, program modules or other data in a modulated data signal, such as a carrier wave or other transport mechanism, and includes any information delivery media. The term "modulated data signal" means a signal that has one or more of its characteristics set or changed in such a manner as to encode information in the signal. By way of example and not

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limitation, communication media includes wired media such as a wired network or direct-wired connection, and wireless media such as acoustic, radio frequency (RF), infrared and other wireless media. Combinations of any of the above should also be included within the scope of computer-readable media.

The system memory **222** includes computer-storage media in the form of volatile and/or non-volatile memory such as ROM **223** and RAM **260**. A BIOS (basic input/output system) **224** containing the basic routines that help to transfer information between elements within computer **241**, such as during start-up, is typically stored in ROM **223**. RAM **260** typically contains data and/or program modules that are immediately accessible to and/or presently being operated on by processing unit **259**. By way of example and not limitation, FIG. **1** illustrates operating system **225**, application programs **226**, other program modules **227**, and program data **228**.

The computer **241** may also include other removable/non-removable, volatile/non-volatile computer storage media. By way of example only, FIG. **1** illustrates a hard disk drive **238** that reads from or writes to non-removable, non-volatile magnetic media, a magnetic disk drive **239** that reads from or writes to a removable, non-volatile magnetic disk **254**, and an optical disk drive **240** that reads from or writes to a removable, non-volatile optical disk **253** such as a CD ROM or other optical media. Other removable/non-removable, volatile/non-volatile computer-storage media that can be used in the exemplary operating environment include, but are not limited to, magnetic tape cassettes, flash memory cards, DVDs, digital video tape, solid state RAM, solid state ROM, and the like. The hard disk drive **238** is typically connected to the system bus **221** through a non-removable memory interface such as non-removable non-volatile memory interface **234**, and magnetic disk drive **239** and optical disk drive **240** are typically connected to the system bus **221** by a removable memory interface, such as removable non-volatile memory interface **235**.

The drives and their associated computer-storage media, discussed above and illustrated in FIG. **1**, provide storage of computer-readable instructions, data structures, program modules and other data for the computer **241**. In FIG. **1**, for example, hard disk drive **238** is illustrated as storing operating system **258**, application programs **257**, other program modules **256**, and program data **255**. Note that these components can either be the same as or different from operating system **225**, application programs **226**, other program modules **227**, and program data **228**. Operating system **258**, application programs **257**, other program modules **256**, and program data **255** are given different numbers here to illustrate that, at a minimum, they are different copies. A user may enter commands and information into the computer **241** through input devices such as a keyboard **251** and pointing device **252**, commonly referred to as a mouse, trackball, or touch pad. Other input devices (not shown) may include a microphone, joystick, game pad, satellite dish, scanner, or the like. These and other input devices are often connected to the processing unit(s) **259** through a user input interface **236** that is coupled to the system bus **221**, but may be connected by other interface and bus structures, such as a parallel port, game port or a universal serial bus (USB). A monitor **242** or other type of display device is also connected to the system bus **221** via an interface, such as a video interface **232**. In addition to the monitor **242**, computer **241** may also include other peripheral output devices such as speakers **244** and printer **243**, which may be connected through an output peripheral interface **233**.

The computer **241** may operate in a networked environment using logical connections to one or more remote com-

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puters, such as a remote computer **246**. The remote computer **246** may be a personal computer, a server, a router, a network PC, a peer device or other common network node, and typically includes many or all of the elements described above relative to the computer **241**, although only a memory storage device **247** has been illustrated in FIG. **1**. The logical connections depicted in FIG. **1** include a local area network (LAN) **245** and a wide area network (WAN) **249**, but may also include other networks. Such networking environments are commonplace in offices, enterprise-wide computer networks, intranets and the Internet.

When used in a LAN networking environment, the computer **241** is connected to the LAN **245** through a network interface **237**. When used in a WAN networking environment, the computer **241** typically includes a modem **250** or other means for establishing communications over the WAN **249**, such as the Internet. The modem **250**, which may be internal or external, may be connected to the system bus **221** via the user input interface **236** or other appropriate mechanism. In a networked environment, program modules depicted relative to the computer **241**, or portions thereof, may be stored in the remote memory storage device. By way of example and not limitation, FIG. **1** illustrates remote application programs **248** as residing on memory storage device **247**. It will be appreciated that the network connections shown are exemplary and that other means of establishing a communications link between the computers may be used.

It should be understood that the various techniques described herein may be implemented in connection with hardware or software or, where appropriate, with a combination of both. Thus, the methods and apparatus of the subject matter, or certain aspects or portions thereof, may take the form of program code (i.e., instructions) embodied in tangible media, such as floppy diskettes, CD-ROMs, hard drives, or any other machine-readable storage medium wherein, when the program code is loaded into and executed by a machine, such as a computer, the machine becomes an apparatus for practicing the subject matter. In the case of program code execution on programmable computers, the computing device generally includes a processor, a storage medium readable by the processor (including volatile and non-volatile memory and/or storage elements), at least one input device, and at least one output device. One or more programs may implement or utilize the processes described in connection with the subject matter, e.g., through the use of an API, reusable controls, or the like. Such programs are preferably implemented in a high-level procedural or object-oriented programming language to communicate with a computer system. However, the program(s) can be implemented in assembly or machine language, if desired. In any case, the language may be a compiled or interpreted language, and may be combined with hardware implementations.

Although exemplary embodiments may refer to utilizing aspects of the subject matter in the context of one or more stand-alone computer systems, the subject matter is not so limited, but rather may be implemented in connection with any computing environment, such as a network or distributed computing environment. Still further, aspects of the subject matter may be implemented in or across a plurality of processing chips or devices, and storage may similarly be affected across a plurality of devices. Such devices might include personal computers, network servers, handheld devices, supercomputers, or computers integrated into other systems such as automobiles and airplanes.

In light of the diverse computing environments that may be built according to the general framework provided in FIG. **1**, the systems and methods provided herein cannot be construed

as limited in any way to a particular computing architecture. Instead, the subject matter should not be limited to any single embodiment, but rather should be construed in breadth and scope in accordance with the appended claims.

Referring next to FIG. 2, shown is an exemplary networked computing environment in which many computerized processes may be implemented to perform the processes described above. For example, parallel computing may be part of such a networked environment with various clients on the network of FIG. 2 using and/or implementing the processes for providing the subject matter of the present disclosure. One of ordinary skill in the art can appreciate that networks can connect any computer or other client or server device, or that computers may be connected in a distributed computing environment. In this regard, any computer system or environment having any number of processing, memory, or storage units, and any number of applications and processes occurring simultaneously, is considered suitable for use in connection with the systems and methods provided.

Distributed computing provides sharing of computer resources and services by exchange between computing devices and systems. These resources and services include the exchange of information, cache storage, and disk storage for files. Distributed computing takes advantage of network connectivity, allowing clients to leverage their collective power to benefit the entire enterprise. In this regard, a variety of devices may have applications, objects, or resources that may use the processes described herein.

FIG. 2 provides a schematic diagram of an exemplary networked or distributed computing environment. The environment comprises computing devices 271, 272, 276, and 277 as well as objects 273, 274, and 275, and database 278. Each of these computing devices 271, 272, 273, 274, 275, 276, 277 and 278 may comprise or make use of programs, methods, data stores, programmable logic, etc. The computing devices 271, 272, 273, 274, 275, 276, 277 and 278 may span portions of the same or different devices such as personal data assistants (PDAs), audio/video devices, MP3 players, personal computers, etc. Each computing device 271, 272, 273, 274, 275, 276, 277 and 278 can communicate with another computing device 271, 272, 273, 274, 275, 276, 277 and 278 by way of the communications network/bus 270. In this regard, any entity may be responsible for the maintenance and updating of a database 278 or other storage element.

The communications network 270 may itself comprise other computing entities that provide services to the system of FIG. 2, and may itself represent multiple interconnected networks. In accordance with an aspect of the subject matter, each computing device 271, 272, 273, 274, 275, 276, 277 and 278 may contain discrete functional program modules that might make use of an API, or other object, software, firmware and/or hardware, to request services of one or more of the other computing devices 271, 272, 273, 274, 275, 276, 277 and 278.

It can also be appreciated that an object, such as 275, may be hosted on another computing device 276. Thus, although the physical environment depicted may show the connected devices as computers, such illustration is merely exemplary and the physical environment may alternatively be depicted or described comprising various digital devices such as PDAs, televisions, MP3 players, etc., or software objects such as interfaces, communication (COM) objects, and the like.

There are a variety of systems, components, and network configurations that support distributed computing environments. For example, computing systems may be connected by wired or wireless systems, by local networks or widely distributed networks. Currently, many networks are coupled to

the Internet, which provides an infrastructure for widely distributed computing and encompasses many different networks. Any such infrastructures, whether coupled to the Internet or not, may be used in conjunction with the systems and methods provided.

A network infrastructure may enable a host of network topologies such as client/server, peer-to-peer, or hybrid architectures. The "client" is a member of a class or group that uses the services of another class or group to which it is not related. In computing, a client is a process, i.e., roughly a set of instructions or tasks, that requests a service provided by another program. The client process utilizes the requested service without having to "know" any working details about the other program or the service itself. In a client/server architecture, particularly a networked system, a client is usually a computer that accesses shared network resources provided by another computer, e.g., a server. In the example of FIG. 2, any entity 271, 272, 273, 274, 275, 276, 277 and 278 can be considered a client, a server, or both, depending on the circumstances.

A server is typically, though not necessarily, a remote computer system accessible over a remote or local network, such as the Internet. The client process may be active in a first computer system, and the server process may be active in a second computer system, the computer systems communicating with one another over a communications medium, thus providing distributed functionality and allowing multiple clients to take advantage of the information-gathering capabilities of the server. Any software objects may be distributed across multiple computing devices or objects.

Client(s) and server(s) communicate with one another utilizing the functionality provided by protocol layer(s). For example, HyperText Transfer Protocol (HTTP) is a common protocol that is used in conjunction with the World Wide Web (WWW), or "the Web." Typically, a computer network address such as an Internet Protocol (IP) address or other reference such as a Universal Resource Locator (URL) can be used to identify the server or client computers to each other. The network address can be referred to as a URL address. Communication can be provided over a communications medium, e.g., client(s) and server(s) may be coupled to one another via TCP/IP connection(s) for high-capacity communication.

In light of the diverse computing environments that may be built according to the general framework provided in FIG. 2 and the further diversification that can occur in computing in a network environment such as that of FIG. 2, the systems and methods provided herein cannot be construed as limited in any way to a particular computing architecture or operating system. Instead, the subject matter should not be limited to any single embodiment, but rather should be construed in breadth and scope in accordance with the appended claims.

The Check 21 Act allows the use of a digital image of a negotiable instrument for processing a negotiable instrument deposit transaction in lieu of using the physical negotiable instrument. The ownership and use of digital cameras for image capture have increased over the past several years. When a picture is taken using a digital camera, the raw digital image information is typically compressed and stored in joint photographic expert group ("JPG" or "JPEG") digital image file formats, which are functionally the same but with different file extensions, depending upon the software. Digital cameras using other software platforms may compress and save the image using other formats, such as graphic interchange form a ("GIF"), JPEG, Windows bitmap ("BMP"), etc.

A digital camera may also take pictures in a video format, such as the Motion Picture Exports Group ("MPEG") format.

If a digital video is taken, a digital image may be extracted from one of the frames of the digital video and used as a substitution for a single picture. The extraction of an image is not limited to digital video, as pictures taken from plastic video may be used as well.

To extract character information from the digital image, the digital image file may be processed through an optical character recognition (OCR) application. There are generally two OCR methods of extracting information from a digital image file: matrix matching and feature extraction. Matrix matching analyzes the digital image and extracts possible characters. The extracted characters are then compared against a library of characters to determine if there is a match. If a match is determined, a corresponding ASCII character is assigned to the extracted character. Feature extraction, or intelligent character recognition (ICR), uses a process that looks for features such as open areas, diagonal lines, intersections of lines, closed shapes, etc. The application then uses that information and intelligence about the process to extract information. Feature extraction is a more robust analysis but typically requires more processing power than does matrix matching.

For example, FIG. 3a illustrates a digital image of negotiable instrument 300 taken by a digital camera. Negotiable instrument 300 has box 308 which has character "+"310 within the box. The digital image rotation, or skew, is shown to be zero (0), as illustrated by the matching of the borders of negotiable instrument 300 with y-axis 322 and x-axis 320. Because the skew of the digital image in FIG. 3a is negligible, the less robust matrix matching technique may be a technique that may require less computing resources, though the feature extraction may also be used interchangeably.

If the image is skewed, feature extraction may be used to properly extract and recognize characters in the image. FIG. 3b is a digital image of negotiable instrument 300 of FIG. 3a having box 308 with character "+"310 within the box. The digital image has a degree of skew, illustrated by the angle of rotation of negotiable instrument 300 in relation to y-axis 322 and x-axis 320. If the skew is significant, a matrix matching technique may not be useful. For Example, character "+"310 may be interpreted as an "X" rather than a "+". Feature extraction may also be used, as box 308 may be recognized, but may be limited in the determination of character "+"310. In order to determine the identification of characters in negotiable instrument 300, the skew of the digital image may need to be determined and compensated for prior to character extraction and recognition, as described below.

While skew or rotation may be one way in which distortion of the digital image may occur, if a user that takes a picture of the negotiable image does not position the digital camera in an optimal position, the digital image of the negotiable instrument may be distorted. For example, the digital image may be distorted to a degree so that the shape of the negotiable image is not rectangular, but rather, trapezoidal, as shown in FIG. 3c. The image may be distorted in other manners, and thus, the present subject matter is not limited to a trapezoidal distortion. It should be appreciated that an image may be distorted in ways other than the non-limiting and exemplary trapezoidal distortion. The present disclosure is not limited to any one type of distortion.

FIG. 3c is an exemplary and non-limiting diagram illustrating a distorted image captured by taking a digital picture of check 300. Check 300 has sides 340a-d and corners 350a-d. A significant portion of negotiable instruments used in commerce are rectangular in shape, i.e. the sides of check 300, in the physical embodiment, form a rectangle where two parallel sides are essentially of one length and where the other two parallel sides are essentially of the same or another

length. Further, the internal angles of check 300, illustrated by angles 360 and 362, are 90 degrees in the physical embodiment.

As shown, the digital image captured by taking a picture of check 300 does not follow the basic qualities of a rectangle. Rather, the digital image of FIG. 3c illustrates a trapezoidal shape caused by, among other things, a camera viewing angle of a suboptimal position, creating a distorted image. The suboptimal position may occur if the digital camera is not positioned directly above check 300. Sides 342a and 342b, while parallel to each other, are shown to not be equal in length. Sides 342c and 342d, while also parallel to each other, are shown to not be equal in length. Further, because the image is not a rectangular representation of check 300, angles 362 and 360 are not 90 degrees. Thus, if an OCR or ICR feature extraction process were to be performed on the image of FIG. 3c, the information may be erroneous. Further, the image may be distorted to a point that the image may not be acceptable for use within the Federal Check Clearinghouse system, or other check clearings systems that may be implemented.

To remove the distortion, the image may be modified. An exemplary and non-limiting process of removing distortion may be to use a technique called spatial transformation, also known as image warping. In spatial transformation, a pixel in the image of FIG. 3c is mapped or placed into a position in a new image, such as image of FIG. 3d. The process repeats until all or an acceptable number of pixels in the original image are mapped to form an output image, resulting in a warped image. The position of the pixel and the relative position of other pixels of an input image to an output image, such as the image of FIG. 3d, may be determined by using geometrically known information. For example, a negotiable instrument, such as check 300, will have 4 corners and sides that are positioned and sized to form a rectangle. Further, the internal angles of check 300 will most likely be essentially 90 degrees. Although the present subject matter uses warping to remove the distortion from an image, it should be appreciated that other methods of distortion removal may be used, and thus, the present subject matter is not limited to any particular type of image distortion removal.

One exemplary and non-limiting way in which image warping may be accomplished may be to use information about the four corners of check 300 to determine new positions of pixels. Although the present subject matter uses the four corners of the image to warp an image, it should be appreciated that other methods of warping an image may be used, and thus, the present subject matter is not limited to using the four corners of an image. Although the four corners of an image, such as the image in FIG. 3c, may be determined upon initial analysis of the image, if the image has colors or features in the body, or the portion of the image within the four corners, of the image, the analysis may be difficult and/or unreliable. Thus, it may be preferable, for the purpose of analyzing the image, to first remove any colors or features within the body of the image.

One exemplary and non-limiting way in which to remove the features in the body of the image is to use the image histogram values to reduce certain image values to essentially null. Although the present subject matter uses the image histogram to remove features in the body of the image, it should be appreciated that other methods may be used, and thus, the present subject matter is not limited to using the image histogram. An image histogram is a graphical representation of the number of pixels across the particular shades of the image. Certain values of the histogram may be essentially zeroed, or floored, so that the image contents may be

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removed. For example, the values in the histogram resembling black may be floored. Once the features in the body are essentially removed, a convolution filter may be applied to “blank” any features in the body of the check. The remaining features may need to be removed because they may affect the determination of the corners of the image.

After the image has been prepared, the image may be analyzed to determine the four corners of the image. FIG. 3e is illustrative of an exemplary and non-limiting way in which the four corners of the image of check 300 may be determined. For purposes of the following explanation, the determination of corner 388 is explained, though it should be appreciated that the other corners may be determined using the same or a similar process. In FIG. 3e is shown an image of check 300. The image is distorted in a manner similar to the image in FIG. 3c, e.g. the image does not appear to be rectangular in shape. To warp the image, the location of corner 388 is determined.

In one exemplary and non-limiting way in which the location of corner 388 may be determined, the edges of the image of FIG. 3e are analyzed. As shown, the image of check 300 is placed in a geometric frame of reference, represented by axis X and axis Y. A process may start at or near the expected middle of the image and near the origin and determine the left boundary, or side, of the image by analyzing lines of the image, represented by analysis lines 380. The process may continue until going up axis Y until a left boundary is not found, represented by analysis line 386. Because the left boundary was not located when analyzing along line 386, the last analysis line to locate the left boundary is the top of the image, shown by location X1,Y1.

The right side of the image is then analyzed in a similar fashion. To reduce the analysis time, the process may begin at a Y coordinate close to or slightly less than Y1, represented by location X2, Y2. The analysis continues until the top of the image is determined from analysis line 384, represented by location X3, Y1. Although the Y coordinates of the left and right side are shown to be the same, Y1, it should be understood that the top left of the image may be different than the top right of the image. For example, the image may be rotated. The result is that corner 388 is determined to be location X3, Y1.

Once the corners are determined, to warp the image into an output image, such as the image of FIG. 3d, the location of the pixels in the image of FIG. 3e to FIG. 3c needs to be determined. Thus, a qualitative analysis of the distortion of the image of FIG. 3e needs to be determined. One exemplary and non-limiting way in which to determine image distortion is to use the information from the corner determination. For example, the slope of a line between X3 and X2 may be used to determine the amount of distortion. If the image was not distorted, such as the image in FIG. 3d, a slope of a line between X3 and X2 would be infinite, resulting in no distortion along the X axis. Using information from the other corners, or another corner as desired, the distortion of the image of FIG. 3e may be determined. Once the distortion is determined, i.e. the amount of change of the image on both the X and Y axis, the pixels may be mapped to an output image based upon that distortion.

FIG. 4a illustrates an exemplary and non-limiting system for using a digital camera to capture a digital image of a negotiable instrument. An account owner (not shown) has financial account 460 established at bank 430. Bank 430 is configured to process a deposit transaction using a digital image of a negotiable instrument rather than the negotiable instrument itself. The account owner establishes communication pathway 420, which may be through an Internet con-

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nection, with bank 430 in anticipation of depositing check 414. The account owner uses digital camera 402 to capture an image of check 414. The digital image is compressed and stored as various file formats, including jpg. The account owner then downloads the digital image to computer 410 and submits via communication pathway 420 the digital image to the bank 430 for processing.

In one exemplary and non-limiting example, check 414 may be a method of payment to a business. In that example, the account owner may be the business owner. In another exemplary and non-limiting embodiment, computer 410 may be associated with a customer of a business that controls account 460. In that example, the customer may transmit an image of check 414 to bank 430 for payment of a debt.

Digital camera 402 may be a standalone digital camera or may be integrated with other electronic equipment, such as a personal data assistant, a web camera, or a cellular phone. FIG. 4b is an exemplary illustration of a system using the digital camera of a cellular phone to capture digital images. As in FIG. 4a, account owner (not shown) has account 460 with bank 430. Account owner uses computer 410 to establish communication pathway 420 with bank 430 in anticipation of depositing check 414 into account 460. Account owner uses the digital camera of cellular phone 405 to capture a digital image of check 414. The digital image is stored in cellular phone 405 after capture.

The account owner then causes the cellular phone 405 to transmit the digital image to computer 410 via a cellular network, illustrated in part by cellular transceiver 448 and network 450. The connection of network 450 with computer 410 may vary, the present disclosure not being limited to any one particular type of connection. For exemplary purposes only, the connection may be via an Internet connection between a cellular network and computer 410. Once the digital image is received at computer 410, the account owner may then transmit the digital image to bank 430 for processing a deposit transaction using the digital image.

FIG. 5 is illustrative of depositing funds of a negotiable instrument, such as a check, using a digital image. The account owner first receives 500 a check and then endorses 502 the check in anticipation of depositing the check into an account. If the check is to be deposited using electronic means, the account owner then takes 504 a digital picture of the check. The account owner may use various types of digital cameras to take the digital picture, as described above. The present subject matter is not limited to any particular type or combination of digital camera or any particular embodiment of a digital camera within an apparatus or system.

After the digital image is taken, the image is transmitted 506 to the user computer. The transmission may occur using various communication means, including, but not limited to, a direct connection to the computer, radio, infrared, Bluetooth®, local area network, wireless network, 802.x, or a cellular connection using a cellular network. The digital image file is created 508 using the digital image. Although shown after transmitting 506 the digital image, the digital image file may be created 508 prior to transmission if the digital camera is configured to have the capability of compressing and storing the raw digital image in a digital image file format. The digital image file is then transmitted 510 to the bank for processing a deposit transaction. The transmission of the digital image file may occur using various transmission means, including, but not limited to, an Internet connection between the bank and the account owner's computer. The present subject matter is not limited to any one or combination of transmission means.

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FIG. 6 is illustrative of the receipt and processing of the digital image. The bank will receive **600** a request to deposit a check. The request may be received using various communication means, the present subject matter not being limited to any one or combination of transmission means. The bank then receives **602** the digital image of the check. The digital image may be sent in conjunction with or as a separate transmission from the deposit request. The bank then verifies **604** the digital information.

Depending upon the standards imposed by the Check 21 Act and the bank's own internal image standards, the verification of the digital image may vary. For example, the Check 21 Act may require that the image be of a certain image quality. Although there are several ways in which image quality may be determined, one manner in which it may be done is to perform an OCR operation on the check to determine if at least a portion of the information in the image is determinable. The bank may first attempt to extract and recognize characters within the digital image. Any extracted characters may then be compared to previously known information or information submitted by the account owner in the deposit request. For example, the bank may attempt to find and OCR the magnetic ink character recognition (MICR) line at the bottom of the digital image. If the MICR line is unreadable or the characters identified do not correspond to known and verifiable information, the bank may reject the image.

The bank may also attempt to correct the image if the initial verification process does not yield valid information. Although there may be issues with the resolution and size of the image, a significant portion of images may be deemed less than acceptable because of the skew in the digital image. As discussed previously, skew is the difference in rotation off an axis between a feature in the digital image and the same feature in the physical embodiment of the digital image. The determination of skew of digital images captured using handheld digital cameras typically are computed in 3-dimensions. For exemplary purposes only, the following deskew process uses an x and y axis, though it should be understood that the principles and methods for determining skew in three (3) dimensions use the same principles and are considered to be incorporated into the present subject matter.

To deskew an image, the angle of a reference line within the digital image is determined. More than one reference line may be used as well. The angle of the line or lines is determined using a coordinate system as a reference. For example, one of the lines of box **308** of FIG. **3b** may be used. The angle of the line is determined in reference to a set of axes, such as y-axis **322** and x-axis **320** of FIG. **3b**. The image is then digitally rotated so that the angle is zero (0), and another attempt at OCR is performed on the image to determine if the rotated digital image is acceptable for use.

When processing a check, there may be useful reference points in the check that facilitates the proper rotation of the image. For example, a check typically has several horizontal lines near the bottom of the check, used by the check writer to sign the check and to note the use of the check. Additionally, checks are typically rectangular in shape. A determination may be made to use the two long edges of the digital image and/or the lines within the check as reference points. If the image is rotated so that the long lines and/or the lines within the check are horizontal, the check image may be properly deskewed. After deskewing, if necessary, the bank may then perform an OCR operation again to determine if information may be extracted, recognized and verified. If the information is verified, the bank may then process **606** the deposit request.

FIG. **6a** is an exemplary and non-limiting flow diagram illustrating a deskew process. The image is received **608** by

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the bank to be used in connection with a deposit transaction. The check image is analyzed **610** and the amount of skew is determined **612**. If the skew is determined **614** to be greater than a threshold amount, the image is deskewed **616** and information is extracted **618** from the check. If the skew is determined **614** to be less than a threshold amount, information is extracted **618** from the check.

Because the deskewing process and OCR process may take significant computing resources, a user's computer, such as a home desktop, may not have the processing facilities to handle the computations to verify the digital information. FIG. **7** is illustrative of a system that may facilitate the verification of the digital image information without requiring the user's computer to have the computing resources to handle such an operation. A user (not shown) uses the integrated digital camera in cellular phone **704** to capture a digital image of check **714**.

The user causes cellular phone **704** to transmit the digital image to bank **730** via cellular transceiver **706**, cellular network application provider **710**, and communication pathway **740**. Prior to depositing check **714** into account **760**, bank **730** may verify the digital image received, determining if the information extracted from the digital image is valid. Bank **730** may use application server **750** to perform the image validation and image correction. By processing the digital image at server **750**, the user may not need access to the computing resources that may otherwise be required to verify the digital image.

To possibly reduce the amount of skew and to increase image quality, a user may use an apparatus to help align the negotiable instrument with the digital camera. FIG. **8** is illustrative of an apparatus that may be used to assist in capturing a digital image. Apparatus **804** may be a box (shown in 2 dimensions) that is sized in a manner that allows the user to place negotiable instrument **800** within the box. Apparatus **804** may also have support platform **808**, upon which digital camera **810** may be placed. Support platform **808** may be configured to orient digital camera **810** in a manner to reduce any distortion or skewing of an eventual digital image. To take a picture, apparatus **804** also comprises aperture **806**, through which negotiable instrument **800** may be visible to digital camera **810**.

Because digital cameras today are becoming increasingly technologically advanced, the digital camera may be loaded with software that provides visual aids to the user to assist the user in aligning the camera with the negotiable instrument. A significant number of digital cameras in use today provide an electronic assistance aid to the camera user when the snapshot button on the digital camera, the button that causes the digital camera to take a picture, is partially depressed. The electronic aid becomes visible through or at the camera's viewfinder. The digital camera may be configured to pre-analyze the preview picture and find features of the image for focus purposes. Typically, the camera will analyze the preview picture to attempt to find a person's face, the closest object, or the largest object in the viewfinder.

The digital camera may be configured to analyze the image in the viewfinder to assist the user in aligning the camera. FIG. **8a** illustrates a viewfinder configured to provide an electronic alignment aid. A user aligns a digital camera (not shown) so that negotiable instrument **824** is visible within viewfinder **822**. The user partially depresses the snapshot button to begin analysis of the image within viewfinder **822**. The digital camera may be configured to attempt to find MICR information **826** of negotiable instrument **824**. If the digital camera is able to analyze the image and finds MICR information **826**, the camera may expose an alignment aid

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tool to help the user align the check within the camera. For example, alignment aid tool **828** becomes visible within viewfinder **822** when MICR information **826** is found by the digital camera. The user may align the camera to place MICR information **826** within the boundaries of alignment aid tool **828**. Thus, when a picture is taken after alignment, any skew or distortion of the digital image of negotiable instrument **824** may be minimized.

With the increasing use of cellular phones today, and because of the increasing integration of digital cameras with cellular phones, there is an increasing likelihood that the digital camera a person may have access to may be the one integrated into their cellular phone. FIG. 9 is an exemplary and non-limiting system using a cellular phone to transmit and communicate digital image information.

In FIG. 9, a user (not shown) has account **960** with bank **930**. Another person, such as a business associate, may write check **914** to the user as payment for a past debt or for other reasons. Because of various reasons, the user holding account **960** or the user writing check **914** may not find it efficient or feasible to mail check **914**. Thus, the user writing check **914** may take an image of check **914** using the digital camera of cellular phone **944**. The user writing check **914** may then transmit the image via cellular network **942** to cellular phone **904** of the user holding account **960**. The user holding account **960**, after receiving the image, may then transmit the digital image to bank **930** via communication pathway **906**, which may include a combination of a cellular network and/or an Internet connection. After receiving the image, bank **930** may process the image for deposit into account **960**.

To help facilitate the transaction, the user holding account **960** may send additional information to bank **930**. For example, the user may send a text message. A text message for a cellular phone is alphanumeric data transmitted over the cellular network instead of voice data. FIG. 10 is an exemplary and non-limiting screenshot of a cellular phone, such as cellular phone **904** of FIG. 9, showing information that may be sent along with the digital image. Screen **1000** shows text information that may need to be provided to a bank to process a deposit transaction. Text **1002** may be an account number. Text **1004** may be an amount to be deposited. Text **1006** may be a pass code, password, or a personal identification number, which may be used to provide a level of security. The text information may be sent in the same message as the digital image, in a prior message or a subsequent message.

The methods and apparatus of the present subject matter may also be embodied in the form of program code that is transmitted over some transmission medium, such as over electrical wiring or cabling, through fiber optics, or via any other form of transmission, wherein, when the program code is received and loaded into and executed by a machine, such as an EPROM, a gate array, a programmable logic device (PLD), a client computer, a video recorder or the like, the machine becomes an apparatus for practicing the subject matter. When implemented on a general-purpose processor, the program code combines with the processor to provide a unique apparatus that operates to perform the functionality of the present subject matter.

While the present subject matter has been described in connection with the preferred embodiments of the various figures, it is to be understood that other similar embodiments may be used or modifications and additions may be made to the described embodiments for performing the same function of the present subject matter without deviating there from. Furthermore, it should be emphasized that a variety of computer platforms, including handheld device operating systems and other application-specific hardware/software inter-

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face systems, are herein contemplated, especially as the number of wireless networked devices continues to proliferate. Therefore, the present subject matter should not be limited to any single embodiment, but rather construed in breadth and scope in accordance with the appended claims.

Finally, the disclosed embodiments described herein may be adapted for use in other processor architectures, computer-based systems, or system virtualizations, and such embodiments are expressly anticipated by the disclosures made herein and, thus, the present subject matter should not be limited to specific embodiments described herein but instead construed most broadly.

What is claimed is:

1. A method for depositing funds of a negotiable instrument, the method executable by a computing device having a processor and memory, comprising:

accessing a digital picture of the negotiable instrument, the digital picture captured with a digital camera in communication with the computing device;

warping, by the processor, the digital picture to remove a distortion by:

determining a histogram of the digital picture, wherein the histogram comprises a plurality of values of pixels of the digital picture;

flooring at least one value of the plurality of values of the pixels;

filtering at least a portion of the digital picture;

determining at least one corner of the digital picture; and mapping the pixels of the digital picture into an output image based on the at least one determined corner;

creating a digital image file with the computing device, wherein the digital image file comprises the output image;

transmitting the digital image file; and

transmitting, by the computing device, a request to deposit the funds of the negotiable instrument using the digital image file.

2. The method of claim 1, wherein the negotiable instrument comprises a check.

3. The method of claim 1, wherein the digital camera is integrated into a cellular telephone, a personal data assistant, or a web camera.

4. The method of claim 1, wherein mapping the pixels of the digital picture removes skew of the digital picture, aligns the digital picture, or enhances features of the digital picture.

5. The method of claim 1, further comprising extracting information from the digital picture.

6. The method of claim 5, wherein the information is magnetic ink character recognition information, an account number, a routing number, or a deposit amount.

7. A system for depositing funds of a negotiable instrument, comprising:

a processor and a memory, the processor configured to access a digital picture of the negotiable instrument captured with a digital camera in communication with the processor and saved in the memory;

wherein, to warp the digital picture to remove a distortion, the processor is further configured to:

determine a histogram of the digital picture, wherein the histogram comprises a plurality of values of pixels of the digital picture;

floor at least one value of the plurality of values of the pixels;

filter at least a portion of the digital picture;

determine at least one corner of the digital picture; and map the pixels of the digital picture into an output image based on the at least one determined corner; and

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wherein the processor is further configured to:
 create a digital image file with the output image;
 transmit the digital image file; and
 transmit a request to deposit the funds of the negotiable
 instrument using the digital image file.

8. The system of claim 7, wherein the negotiable instru-
 ment comprises a check.

9. The system of claim 7, wherein the digital camera is
 integrated into a cellular telephone, a personal data assistant,
 or a web camera.

10. The system of claim 7, wherein the processor is further
 configured to remove skew of the digital picture, align the
 digital picture, or enhance features of the digital picture.

11. The system of claim 7, further comprising at least one
 subsystem that extracts information from the digital picture.

12. The system of claim 11, wherein the information is
 magnetic ink character recognition information, an account
 number, a routing number, or a deposit amount.

13. A non-transitory computer-readable medium compris-
 ing computer-readable instructions executable by a processor
 and memory for depositing funds of a negotiable instrument,
 the computer-readable instructions comprising instructions
 to direct the processor to:

access a digital picture of the negotiable instrument saved
 in the memory, the digital picture captured with a digital
 camera in communication with the processor;
 warp the digital picture to remove a distortion by directing
 the processor to:
 determine a histogram of the digital picture, wherein the
 histogram comprises a plurality of values of pixels of
 the digital picture;

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floor at least one value of the plurality of values of the
 pixels;

filter at least a portion of the digital picture;
 determine at least one corner of the digital picture; and
 map the pixels of the digital picture into an output image
 based on the at least one determined corner;

create a digital image file comprising the output image;
 transmit the digital image file; and
 transmit a request to deposit the funds of the negotiable
 instrument using the digital image file.

14. The computer-readable medium of claim 13, wherein
 the negotiable instrument comprises a check.

15. The computer-readable medium of claim 13, wherein
 the digital camera is integrated into a cellular telephone, a
 personal data assistant, or a web camera.

16. The computer-readable medium of claim 13, wherein
 the computer-readable instructions to map the pixels of the
 digital picture further comprise computer-readable instruc-
 tions to direct the processor to remove skew of the digital
 picture, align the digital picture, or enhance features of the
 digital picture.

17. The computer-readable medium of claim 13, further
 comprising computer-readable instructions to extract infor-
 mation from the digital picture.

18. The computer-readable medium of claim 17, wherein
 the information is magnetic ink character recognition infor-
 mation, an account number, a routing number, or a deposit
 amount.

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