EXHIBIT 3

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
62/542,661	08/08/2017		130	409000		

CONFIRMATION NO. 7825

FILING RECEIPT

OC000000093422797

145234
RealD Spark, LLC
100 North Crescent Drive
Suite 200
Beverly Hills, CA 90210

Date Mailed: 08/14/2017

Receipt is acknowledged of this provisional patent application. It will not be examined for patentability and will become abandoned not later than twelve months after its filing date. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Eric Sommerlade, Oxford, UNITED KINGDOM;

Applicant(s)

Eric Sommerlade, Oxford, UNITED KINGDOM;

Power of Attorney:
Penny Lowry--57186

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 08/11/2017
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 62/542,661**
Projected Publication Date: None, application is not eligible for pre-grant publication
Non-Publication Request: No
Early Publication Request: No
**** SMALL ENTITY ****
Title

Method and system for improved facial visual data editing using machine learning

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

RealD Exhibit 2006 - Page 2
Microsoft Corporation v. RealD Spark, LLC
IPR2023-01046 - U.S. Patent No. 10,740,985

MSFT_00003118

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

RealD Exhibit 2006 - Page 3
Microsoft Corporation v. RealD Spark, LLC
IPR2023-01046 - U.S. Patent No. 10,740,985

MSFT_00003119

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

RealD Exhibit 2006 - Page 4
Microsoft Corporation v. RealD Spark, LLC
IPR2023-01046 - U.S. Patent No. 10,740,985

MSFT_00003120

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	409000
	Application Number	
Title of Invention	Method and system for improved facial visual data editing using machine learning	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Eric		Sommerlade	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Oxford	Country of Residence i	GB

Mailing Address of Inventor:

Address 1	100 N. Crescent Drive		
Address 2	Suite 200		
City	Beverly Hills	**State/Province**	CA
Postal Code	90210	**Country** i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	145234		
Email Address	patpros@reald.com	Add Email	Remove Email

Application Information:

Title of the Invention	Method and system for improved facial visual data editing using machine learning		
Attorney Docket Number	409000	**Small Entity Status Claimed**	☒
Application Type	Provisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	3	**Suggested Figure for Publication (if any)**	

RealD Exhibit 2006 - Page 5
Microsoft Corporation v. RealD Spark, LLC
IPR2023-01046 - U.S. Patent No. 10,740,985

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	409000
	Application Number	
Title of Invention	Method and system for improved facial visual data editing using machine learning	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number			

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	Remove
Registration Number					

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	Remove
Registration Number					

Additional Representative Information blocks may be generated within this form by selecting the **Add** button.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	409000
	Application Number	
Title of Invention	Method and system for improved facial visual data editing using machine learning	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the application number blank.

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	409000
	Application Number	
Title of Invention	Method and system for improved facial visual data editing using machine learning	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	409000
	Application Number	
Title of Invention	Method and system for improved facial visual data editing using machine learning	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◯ Assignee	◯ Legal Representative under 35 U.S.C. 117	◯ Joint Inventor
◯ Person to whom the inventor is obligated to assign.	◯ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Applicant:

Address 1			
Address 2			
City		**State/Province**	
Country[i]		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	409000
	Application Number	
Title of Invention	Method and system for improved facial visual data editing using machine learning	

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	409000
	Application Number	
Title of Invention	Method and system for improved facial visual data editing using machine learning	

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Penny L. Lowry/			Date (YYYY-MM-DD)	
First Name	Penny L.	Last Name	Lowry	Registration Number	57186

Additional Signature may be generated within this form by selecting the Add button.

PTO/SB/16 (11-08)
Approved for use through 05/31/2015. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

Provisional Application for Patent Cover Sheet

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

Inventor(s)

Inventor 1 — Remove

Given Name	Middle Name	Family Name	City	State	Country
Eric		Sommerlade	Oxford		GB

All Inventors Must Be Listed – Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. — Add

Title of Invention	Method and system for improved facial visual data editing using machine learning
Attorney Docket Number (if applicable)	409000

Correspondence Address

Direct all correspondence to (select one):

◉ The address corresponding to Customer Number	○ Firm or Individual Name
Customer Number	145234

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

- ● No.
- Yes, the invention was made by an agency of the United States Government. The U.S. Government agency name is:
- Yes, the invention was under a contract with an agency of the United States Government. The name of the U.S. Government agency and Government contract number are:

PTO/SB/16 (11-08)
Approved for use through 05/31/2015. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

Entity Status
Applicant asserts small entity status under 37 CFR 1.27 or applicant certifies micro entity status under 37 CFR 1.29

- (●) Applicant asserts small entity status under 37 CFR 1.27
- ( ) Applicant certifies micro entity status under 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
- ( ) No

Warning

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

Signature

Please see 37 CFR 1.4(d) for the form of the signature.

Signature	/Penny L. Lowry/			Date (YYYY-MM-DD)	2017-08-08
First Name	Penny L.	Last Name	Lowry	Registration Number (If appropriate)	57186

This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **This form can only be used when in conjunction with EFS-Web. If this form is mailed to the USPTO, it may cause delays in handling the provisional application.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or paten. Accordingly, pursuant to the requirements of the Act, please be advised that : (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, t o a n other federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Example Deployed System

Example Training Data TD

Example Training System TS

409000 Patent description

Method and system for improved facial visual data editing using machine learning

Abstract:

Facial image features are among the most critically perceived elements by observers. It is desirable to bridge the "uncanny valley". Changes to facial features in a communication setting are often desired by participants: eye gaze direction, nose size and double necks. This patent describes embodiments of a method to apply changes to input data of varying modality by using the input data as guideline. Relevant image patches may be identified, and a feature vector may be derived from plural local image descriptors of the image patches. A displacement vector field representing a transformation of an image patch and geometry may be derived, using the derived feature vector to look up reference data comprising reference displacement vector fields associated with possible values of the feature vector produced by machine learning. The input data may be adjusted by transforming the relevant image patches and geometry data in accordance with the derived displacement vector field.

Example purposes of system:

- The system learns editing instructions to transform input data to a desired target output.
- The system works on data from a given category, in particular human heads, faces, eyes, necks, ears. The category is fixed per embodiment.
- The editing instructions are evaluated by the same implementation per embodiment.
  One embodiment of the editing instructions is to shift a rectangular set of pixels depending on the underlying color information, achieving the adjustment of the gaze of the individual depicted
- The achieved effect of the editing instruction is the same for all input data. Example effects are
  - Adjust the gaze of an individual in the input data to look upward by a certain angle
  - Adjust the nasal region of an individual in the input data to be smaller/slimmer by a fixed proportion (this has the effect of a "tele lens" more suitable for profile photos)
  - Change the hair colour of the subject by a fixed hue
- Output of the system are data editing instructions. These are subsequently applied to any new input not part of the image database or training set
- In one embodiment of the system, the system takes a previously unseen input image of a face, and provides a transformation that adjusts the output image. The output image has the gaze of the observed face in a different direction than in the input image. For all input images, the relative adjustment of the angle is the same (e.g. 15 degrees up), depending on the input conditions (e.g. position of head in input data).

- Example Input domains:
  - 1a at least one image with at least one colour channel, e.g. a gray, RGB, YCrCb image
  - 1b multiple images with different colour channels or sensing modalities, e.g. one RGB, one near-infrared image, or one RGB, one image captured with structured light

        - structured light can be a projected pattern or background flickering of ambient lighting (temporal structure)
    - 1c a mesh or point cloud structure with coloured vertices
    - 1d a mesh with texture index per vertex and associated texture map
    - 1e any other volumetric representation of data which has image data and geometric data

- Output Domain: any of the input domains

Example Components:

- Training system **TS** and evaluation system **ES**
- Editing algorithm **EA**
    - The algorithm takes a given editing instruction (derived from the input data and auxiliary), applies these to the input data to provide the output data
- Lookup instructions **LA**
    - These instructions provide the editing instructions appropriate for the given input data. Embodiments are:
        - A lookup table
        - One or a set of linear regressors
        - A neural network

      Embodiments for Inputs for to these instructions are:
        - A set of input pixels or descriptions thereof
        - A set of geometrical descriptions of the input 3d data

Example Editing instructions **ED**

- These instructions change the input object from the input domain into the output domain representation. This transformation can be supported by auxiliary data, e.g. knowledge of the mesh representation, which can be added to the machine learning algorithm
- Shifts of pixel colours and underlying geometry (e.g. if the texture of the eye is adjusted to move the eyelid, the corresponding 3d geometry also is adjusted)
- Intensity changes to the pixel colours
- Representations of the adjustments using e.g. PCA or a Fourier Transform

- **TS** may be used offline to learn the editing instructions. These instructions may then be deployed to a multitude of **ES**

- Example Input to system **TS**:
    - Machine Learning Algorithm 1 (**MLA1**)
    - Machine Learning Algorithm 2 (**MLA2**), where the accuracy of ML algorithm 2 is not necessarily as good as using **MLA1**. However, **MLA2** performs faster, and can approximate the accuracy of **MLA1** with more training data
    - Editing algorithm **EA1**
    - Editing algorithm **EA2**

- Example Input data to **MLA1**:
    - **TD1**: a set of objects from the input domain (Source), and a set of objects from the output domain with the desired effect, whereas input and desired output object are in one-to-one correspondence (Target)
      MLA1 learns the editing instructions indirectly, through a latent representation.
    - Similarity metric **SM**: a numerical value to measure similarity between the modified input object and the desired output object. .
        - embodiments of similarity metrics may be defined by
            - Average absolute or square difference between result and target
            - Average absolute or square difference between low level representations of result and target (e.g. low level features from deep learning networks, such as VGG16)
            - Penalize "taboo zones" (e.g. sclera) that need to be maintained
            - Penalize deviation of an adjusted feature from known form, (e.g. the iris must stay an elliptical form) – or difference to said form in training data

    - Example Output of **MLA1**:
        - Lookup instruction **LA1** to provide appropriate editing instructions **ED1** for the given data
        - editing instructions **ED1** to modify input object, with the aim to make input object similar to the output object.

    - Example Input to **MLA2**:
        - Training data **TD1**
        - Editing instructions **ED1**, the set of editing information obtained by MLA1.
        - Similarity metric **SM**
        - MLA2 learns the editing information directly. By making the desired output explicit, MLA2 has a better chance at fitting the output,
    - Example Output of **MLA2**:
        - editing instructions **ED2** to modify input object, with the aim to make input object similar to the output object.
        - Lookup instruction **LA2** to provide appropriate editing instructions **ED2** for the given data

- Example Input to system **ES**:
    - Sensor system or network connection **SS**
    - Input data **ID**
    - editing instructions **ED2**
    - lookup instruction **LA2**
    - editing algorithm **EA2**
- Example Output of system ES:
    - Output Data **OD**
    - Display system or network connection **DS**

Example Claims:

1) System and method to apply editing information on input data relating to facial imagery and geometry, whereas the input geometry is aligned with the input image, comprising
    a. A method to locate relevant parts of input data, in particular eye regions, nose or mouth
    b. A method deriving a feature vectors from relevant parts
    c. Applying said feature vectors to LA2 to obtain editing instructions ED2
    d. Applying editing instructions to the input images and input geometry, making consistent adjustments
2) A system according to 1), adding an input camera system comprising at least one camera and a method to match input data to 3d geometry
3) A system according to 1), adding an input camera system comprising a plurality of cameras and a method to estimate 3d geometry
4) A system according to 1), adding an input camera system comprising at least one camera and a depth sensing camera, providing 3d geometry
5) A system according to 1), whereas the facial image region is constrained to be the region of the eyes, and the editing information is adjusting the gaze in the image as well as the eyelids geometry information
    a. Same for nose, (double) chin and neck region
6) A system according to 1), where MLA1 is a neural network and MLA2 is a regression forest
7) A system according to 1), where the output ED2 is are PCA components of the PCA of ED1 data, and EA2 first transforms ED2 output into ED1 by inverse PCA transform
8) A system according to 1), where the output ED2 is are wavelet components of ED1 data, and EA2 first transforms ED2 output into ED1 by inverse wavelet transform
9) A system according to 1) where the input ID is a single image and output OD is single image
10) A system according to 1) where the input ID is a single image and output OD is a pair of stereoscopic images
11) A system according to 1) where the input ID and output OD is a pair of stereoscopic images each

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	Method and system for improved facial visual data editing using machine learning
First Named Inventor/Applicant Name:	Eric Sommerlade
Filer:	Penny Lea Lowry/Stefan Bump
Attorney Docket Number:	409000

Filed as Small Entity

Filing Fees for Provisional

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
PROVISIONAL APPLICATION FILING FEE	2005	1	130	130
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
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			Total in USD ($)	**130**

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The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

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37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	WebADS.pdf	114911 6e5e2657678790ebea50faad15fe0931af4781ff	no	7
Warnings:					
Information:					
2	Provisional Cover Sheet (SB16)	409000_ProvisionalSB.pdf	1477153 cd3a9fbd9dd79fd34b1b745613f949410f919445	no	3
Warnings:					
Information:					
3		409000_PRV_Application.pdf	205423 ec7b7e5725081528e9dcf794275dff6c6c0d2a5e	yes	7
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Drawings-only black and white line drawings		5	7	
	Specification		1	4	
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	29921 2782fefa6d86af5af409b722bf7ca7233a86f3c6	no	2
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New International Application Filed with the USPTO as a Receiving Office
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