



**EXHIBIT A - The intellectual property ledger  
documenting conception, assignment, and ownership of  
Solfice's patents and core intellectual property**

**Attached Below**



US009796400B2

**(12) United States Patent**  
**Puttagunta et al.**

**(10) Patent No.: US 9,796,400 B2**  
**(45) Date of Patent: Oct. 24, 2017**

**(54) REAL TIME MACHINE VISION AND POINT-CLOUD ANALYSIS FOR REMOTE SENSING AND VEHICLE CONTROL**

**(71) Applicant:** Solfice Research, Inc., Albany, CA (US)

**(72) Inventors:** Shanmukha Sravan Puttagunta, Berkeley, CA (US); Fabien Chraim, Berkeley, CA (US); Anuj Gupta, Berkeley, CA (US); Scott Harvey, San Francisco, CA (US); Jason Creadore, Berkeley, CA (US); Graham Mills, Berkeley, CA (US)

**(\*) Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

**(21) Appl. No.: 15/002,380**

**(22) Filed:** Jan. 20, 2016

**(65) Prior Publication Data**

US 2016/0221592 A1 Aug. 4, 2016

**(52) U.S. Cl.**  
CPC ..... B61L 23/34 (2013.01); B61L 23/041 (2013.01); B61L 25/025 (2013.01); B61L 25/04 (2013.01); B61L 27/04 (2013.01); B61L 2205/04 (2013.01)

**(58) Field of Classification Search**  
CPC ..... B61L 23/34; G06K 9/00  
See application file for complete search history.

**(56) References Cited**

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International Search Report and Written Opinion in International Patent Application No. PCT/US16/14196, issued Aug. 30, 2016.

*Primary Examiner* — Jonathan M Dager

*Assistant Examiner* — Alex C Dunn

**(74) Attorney, Agent, or Firm** — Brad Bertoglio



US010366289B2

(12) **United States Patent**  
**Puttagunta et al.**

(10) **Patent No.:** US 10,366,289 B2  
(45) **Date of Patent:** Jul. 30, 2019

(54) **SYSTEMS AND METHODS FOR PROVIDING VEHICLE COGNITION**(71) Applicant: **Solfice Research, Inc.**, San Francisco, CA (US)(72) Inventors: **Shannukha Sravan Puttagunta**, Berkeley, CA (US); **Fabien Chraim**, Berkeley, CA (US); **Scott Harvey**, San Francisco, CA (US)(73) Assignee: **Solfice Research, Inc.**, San Francisco, CA (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/460,120**(22) Filed: **Mar. 15, 2017**(65) **Prior Publication Data**

US 2017/0270361 A1 Sep. 21, 2017

**Related U.S. Application Data**

(60) Provisional application No. 62/308,798, filed on Mar. 15, 2016.

(51) **Int. Cl.****G06K 9/00** (2006.01)**G06T 19/00** (2011.01)

(Continued)

(52) **U.S. Cl.**CPC ..... **G06K 9/00664** (2013.01); **B60W 30/00** (2013.01); **G01C 21/20** (2013.01);

(Continued)

(58) **Field of Classification Search**

None

See application file for complete search history.

(56) **References Cited****FOREIGN PATENT DOCUMENTS**

WO 2015164910 A1 11/2015

**OTHER PUBLICATIONS**Schops "3D Modeling on the Go: Interactive 3D Reconstruction of Large-Scale Scenes on Mobile Devices", IEEE, 2015, pp. 291-299.\*  
(Continued)*Primary Examiner — Wei Wen Yang*(74) *Attorney, Agent, or Firm — Brad Bertoglio; Intelink Law Group, PC*(57) **ABSTRACT**

Systems and methods for providing vehicle cognition through localization and semantic mapping are provided. Localization may involve in vehicle calculation of voxel signatures, such as by hashing weighted voxel data (S900, S910) obtained from a machine vision system (110), and comparison of calculated signatures to cached data within a signature localization table (630) containing previously known voxel signatures and associated geospatial positions. Signature localization tables (630) may be developed by swarms of agents (1000) calculating signatures while traversing an environment and reporting calculated signatures and associated geospatial positions to a central server (1240). Once vehicles are localized, they may engage in semantic mapping. A swarm of vehicles (1400, 1402) may characterize assets encountered while traversing a local environment. Asset characterizations may be compared to known assets within the locally cached semantic map. Differences of omission and commission between observed assets and asset characterizations with the local map cache (1860) may be reported to a central server (1800). Updates to the local signature cache (1852) and/or local map cache

(12) **United States Patent**  
Puttagunta et al.

(10) **Patent No.:** US 10,306,689 B2  
(45) **Date of Patent:** May 28, 2019

(54) **SYSTEMS AND METHODS FOR SHARED MIXED REALITY EXPERIENCES USING DIGITAL, PHYSICAL, TEMPORAL OR SPATIAL DISCOVERY SERVICES**

(71) Applicant: **Solfice Research, Inc.**, San Francisco, CA (US)

(72) Inventors: **Shanmukha Sravan Puttagunta**, Berkeley, CA (US); **Fabien Chraim**, Seattle, WA (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 19 days.

(21) Appl. No.: **15/893,247**

(22) Filed: **Feb. 9, 2018**

(65) **Prior Publication Data**

US 2018/0227974 A1 Aug. 9, 2018

**Related U.S. Application Data**

(60) Provisional application No. 62/457,107, filed on Feb. 9, 2017.

(51) **Int. Cl.**

*G06F 15/16* (2006.01)  
*H04W 76/14* (2018.01)  
*G06T 11/60* (2006.01)  
*H04W 8/00* (2009.01)  
*H04L 29/08* (2006.01)  
*H04W 48/08* (2009.01)  
*H04W 4/46* (2018.01)

(52) **U.S. Cl.**

CPC ..... *H04W 76/14* (2018.02); *G06T 11/60* (2013.01); *H04L 67/16* (2013.01); *H04W*

(58) **Field of Classification Search**

CPC ..... H04L 67/12; H04L 2209/84; G07C 5/008;  
H04W 4/046; G06Q 30/0266  
USPC ..... 709/227

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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340/995.1  
2008/0150786 A1\* 6/2008 Breed ..... B60N 2/2863  
342/53

(Continued)

*Primary Examiner* — Phuoc H Nguyen

(74) *Attorney, Agent, or Firm* — Brad Bertoglio

(57) **ABSTRACT**

Systems and methods allow for devices, such as sensory systems and mixed reality content consuming systems installed within a vehicle, to discover each other, share multidimensional realities, inherit context for mixed reality content, and/or coordinate whilst providing a mixed reality user experience. A discovery service can receive information from multiple devices and correlate digital and physical characteristics thereof to enable devices to discover each other. Characteristics of a device that may be used for pairing may include its orientation physically, the observable reality of a device, the state-machine of the device, the intentions of the device whilst operating autonomously or with external assistance, the location of a device, the temporal/spatial information describing the device's movement over time in a multi-dimensional reality or any unique identifiers contained within or generated by the device.

**INTELLECTUAL PROPERTY ASSIGNMENT AGREEMENT**

**ATTACHED BELOW**



## INTELLECTUAL PROPERTY ASSIGNMENT AGREEMENT

This Intellectual Property Assignment Agreement (“IP Assignment”), dated as of June 15, 2022, is made by Solstice Research, Inc., a Delaware corporation (“Seller”), in favor of Condor Acquisition Sub II, Inc, a Delaware corporation (“Buyer”), the purchaser of certain assets of Seller pursuant to that certain Asset Purchase Agreement between Buyer and Seller, dated as of June 15, 2022 (the “Asset Purchase Agreement”).

**WHEREAS**, under the terms of the Asset Purchase Agreement, Seller has conveyed, transferred, and assigned to Buyer, among other assets, certain intellectual property of Seller, and has agreed to execute and deliver this IP Assignment, for recording with the United States Patent and Trademark Office, and the United States Copyright Office, and corresponding entities or agencies in any applicable jurisdictions.

**NOW THEREFORE**, the parties agree as follows:

1. **Assignment**. For good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Seller hereby irrevocably conveys, transfers, and assigns to Buyer, and Buyer hereby accepts, all of Seller's right, title, and interest in and to the following (the “Assigned IP”):

- 1.1 the patents and patent applications set forth on Schedule 1 hereto and all issuances, divisions, continuations, continuations-in-part, reissues, extensions, reexaminations, and renewals thereof (the “Patents”);
- 1.2 the trademark registrations and applications set forth on Schedule 2 hereto and all issuances, extensions, and renewals thereof (the “Trademarks”), together with the goodwill of the business connected with the use of, and symbolized by, the Trademarks; provided that, with respect to the United States intent-to-use trademark applications set forth on Schedule 2 hereto, the transfer of such applications accompanies, pursuant to the Asset Purchase Agreement, the transfer of Seller's business, or that portion of the business to which the trademark pertains, and that business is ongoing and existing;
- 1.3 the copyright registrations, and applications for registration, and exclusive copyright licenses set forth on Schedule 3 hereto and all issuances, extensions, and renewals thereof (the “Copyrights”);
- 1.4 all rights of any kind whatsoever of Seller accruing under any of the foregoing provided by applicable law of any jurisdiction, by international treaties and conventions, and otherwise throughout the world;
- 1.5 any and all royalties, fees, income, payments, and other proceeds now or hereafter due or payable with respect to any and all of the foregoing; and
- 1.6 any and all claims and causes of action with respect to any of the foregoing, whether accruing before, on, or after the date hereof, including all rights to and claims for damages, restitution, and injunctive and other legal and equitable relief for past, present, and future infringement, dilution, misappropriation, violation, misuse, breach, or default, with the right but no obligation to sue for such legal and equitable relief and to collect, or otherwise recover, any such damages.

2. **Recordation and Further Actions**. Seller hereby authorizes the Commissioner for Patents and the Commissioner for Trademarks in the United States Patent and Trademark Office, and the Register of Copyrights in the United States Copyright Office, and the officials of corresponding entities or agencies in any applicable jurisdictions to record and register this IP Assignment upon request by Buyer. Following the date hereof, upon Buyer's reasonable request, Seller shall take such steps and actions, and provide such cooperation and assistance to Buyer and its successors, assigns, and legal representatives,

including the execution and delivery of any affidavits, declarations, oaths, exhibits, assignments, powers of attorney, or other documents, as may be reasonably necessary to effect, evidence, or perfect the assignment of the Assigned IP to Buyer, or any assignee or successor thereto.

3. Terms of the Asset Purchase Agreement. The parties hereto acknowledge and agree that this IP Assignment is entered into pursuant to the Asset Purchase Agreement, to which reference is made for a further statement of the rights and obligations of Seller and Buyer with respect to the Assigned IP. The representations, warranties, covenants, agreements, and indemnities contained in the Asset Purchase Agreement shall not be superseded hereby but shall remain in full force and effect to the full extent provided therein. In the event of any conflict or inconsistency between the terms of the Asset Purchase Agreement and the terms hereof, the terms of the Asset Purchase Agreement shall govern.

4. Counterparts. This IP Assignment may be executed in counterparts, each of which shall be deemed an original, but all of which together shall be deemed one and the same agreement. A signed copy of this IP Assignment delivered by facsimile, e-mail, or other means of electronic transmission shall be deemed to have the same legal effect as delivery of an original signed copy of this IP Assignment.

5. Successors and Assigns. This IP Assignment shall be binding upon and shall inure to the benefit of the parties hereto and their respective successors and assigns.

6. Governing Law. This IP Assignment and any claim, controversy, dispute, or cause of action (whether in contract, tort, or otherwise) based upon, arising out of, or relating to this IP Assignment and the transactions contemplated hereby shall be governed by, and construed in accordance with, the laws of the United States and the State of Delaware, without giving effect to any choice or conflict of law provision or rule (whether of the State of Delaware or any other jurisdiction).

[SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, Seller has duly executed and delivered this IP Assignment as of the date first above written.

SOLFICE RESEARCH, INC.

By: Stefan S

Name: STEFAN SAFW

Title: PRESIDENT, CEO

Address for Notices:

P.O. BOX 105

SAN FRANCISCO, CA 94104

[ACKNOWLEDGMENT]

STATE OF [STATE]

)

)SS.

COUNTY OF [COUNTY]

)

On the [ORDINAL NUMBER] day of [MONTH], [YEAR], before me personally appeared [SIGNATORY NAME], personally known to me (or proved to me on the basis of satisfactory evidence) to be the person whose name is subscribed to the foregoing instrument, who, being duly sworn, did depose and say that [he/she] executed the same [in [his/her] authorized capacity as the [SIGNATORY TITLE] of [SELLER], the [TYPE OF ENTITY] described], and acknowledged the instrument to be [[his/her] free act and deed/the free act and deed of [SELLER]] for the uses and purposes mentioned in the instrument.

---

Notary Public  
Printed Name:

My Commission Expires: [DATE]

\* See Attached for Notary

AGREED TO AND ACCEPTED:

CONDOR ACQUISITION SUB II, INC.

By: Alan Prescott

Name: Alan Prescott

Title: Secretary

Address for Notices:

2603 Discovery Dr., Suite 100  
Orlando, FL 32826

ACKNOWLEDGMENT

STATE OF FLORIDA

)

COUNTY OF ORANGE

)SS.

)

On the 15 day of June, 2022, before me personally appeared Alan Prescott, personally known to me (or proved to me on the basis of satisfactory evidence) to be the person whose name is subscribed to the foregoing instrument, who, being duly sworn, did depose and say that he executed the same in his authorized capacity as the Secretary of Condor Acquisition Sub II, Inc., the corporation described, and acknowledged the instrument to be his free act and deed/the free act and deed of Condor Acquisition Sub II, Inc. for the uses and purposes mentioned in the instrument.

My Commission Expires:

June 5, 2026

Debra J Romano  
Notary Public

Printed Name: Debra J. Romano



## ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California

County of San Francisco)

On June 13<sup>th</sup>, 2022 before me, Olga Menjivar-Fernandez Notary Public  
(insert name and title of the officer)

personally appeared Stefan Safko,  
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are  
subscribed to the within instrument and acknowledged to me that he/she/they executed the same in  
his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the  
person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing  
paragraph is true and correct.

WITNESS my hand and official seal.

Signature

(Seal)



**SCHEDULE 1**  
**ASSIGNED PATENTS AND PATENT APPLICATIONS**

**Patents**

Title		Jurisdiction	Patent Number	Issue Date
Real Time Machine Vision for Train Control and Protection		United States	10,086,857 B2	10/2/18
Real Time Machine Vision and Point-Cloud Analysis For Remote Sensing and Vehicle Control		United States	9,796,400	10/24/17
Real Time Machine Vision and Point-Cloud Analysis For Remote Sensing and Vehicle Control		United States	10,549,768	2/4/20
Systems and Methods for Creating and Updating 3D Semantic Maps		United States	10,366,289	7/30/19
Systems and Methods for Creating and Updating 3D Semantic Maps		United States	10,489,650	11/26/19
Systems and Methods for Shared Mixed Reality Experiences Using Digital, Physical, Temporal or Spatial Discovery Services		United States	10,306,689 B2	5/28/19

**Patent Applications**

Title		Jurisdiction	Application/ Publication Number	Filing Date
Systems and Methods for Train Control Using Locomotive Mounted Computer Vision		United States	61/909,525	11/27/13
Real Time Machine Vision and Point-Cloud Analysis For Remote Sensing and Vehicle Control		United States	16/116,886	8/29/18
A Scalable Approach to Point-Cloud Data Processing for Railroad Asset Location and Health Monitoring		United States	62/105,696	1/20/15
Real Time Machine Vision and Point-Cloud Analysis For Remote Sensing and Vehicle Control		PCT	PCT/US16/0141 96	1/20/16
Real Time Machine Vision and Point-		China	2016800064316	7/19/17

Cloud Analysis For Remote Sensing and Vehicle Control				
Real Time Machine Vision and Point-Cloud Analysis For Remote Sensing and Vehicle Control		EU	16740714.7	7/26/17
Real Time Machine Vision and Point-Cloud Analysis For Remote Sensing and Vehicle Control		India	201717027077	7/31/17
Real Time Machine Vision and Point-Cloud Analysis For Remote Sensing and Vehicle Control		Japan	2017-556798	7/3/17
Systems and Methods for Creating and Updating 3D Semantic Maps		United States	62/308,798	3/15/16
Systems and Methods for Creating and Updating 3D Semantic Maps		United States	16/147,669	9/29/18
Systems and Methods for Creating and Updating 3D Semantic Maps		United States	16/147,675	9/29/18
Systems and Methods for Creating and Updating 3D Semantic Maps		PCT	PCT/US17/22598	3/15/17
Systems and Methods for Creating and Updating 3D Semantic Maps		China	201780017483.8	9/14/18
Systems and Methods for Creating and Updating 3D Semantic Maps		EU	17767482.7	11/22/18
Systems and Methods for Creating and Updating 3D Semantic Maps		India	201817034670	9/14/18
Systems and Methods for Creating and Updating 3D Semantic Maps		Japan	2018-568168	9/13/18
MIXED REALITY EXPERIENCES USING DIGITAL, PHYSICAL, TEMPORAL OR SPATIAL DISCOVERY SERVICES		United States	62/457,107	2/9/17
SYSTEMS AND METHODS FOR SHARED MIXED REALITY EXPERIENCES USING DIGITAL, PHYSICAL, TEMPORAL OR SPATIAL DISCOVERY SERVICES		United States	16/423,117	5/27/19
SYSTEMS AND METHODS FOR SHARED MIXED REALITY		PCT	PCT/US18/17662	2/9/18

EXPERIENCES USING DIGITAL, PHYSICAL, TEMPORAL OR SPATIAL DISCOVERY SERVICES				
SYSTEMS AND METHODS FOR SHARED MIXED REALITY EXPERIENCES USING DIGITAL, PHYSICAL, TEMPORAL OR SPATIAL DISCOVERY SERVICES		China	201880010561.6	8/7/19
SYSTEMS AND METHODS FOR SHARED MIXED REALITY EXPERIENCES USING DIGITAL, PHYSICAL, TEMPORAL OR SPATIAL DISCOVERY SERVICES		EU	18751125.8	8/29/19
SYSTEMS AND METHODS FOR SHARED MIXED REALITY EXPERIENCES USING DIGITAL, PHYSICAL, TEMPORAL OR SPATIAL DISCOVERY SERVICES		Japan	2019542665	8/6/19
SYSTEMS AND METHODS FOR SHARED MIXED REALITY EXPERIENCES USING DIGITAL, PHYSICAL, TEMPORAL OR SPATIAL DISCOVERY SERVICES		South Korea	10-2019- 7026541	8/9/19
MAP DATA CO-REGISTRATION SYSTEM AND METHOD		United States	62/822,682	3/22/19
MAP DATA CO-REGISTRATION SYSTEM AND METHOD		PCT	PCT/US2020/02 4316	3/23/20

**SCHEDULE 2**  
**ASSIGNED TRADEMARK REGISTRATIONS AND APPLICATIONS**

**Trademark Registrations**

<b>Mark</b>	<b>Jurisdiction</b>	<b>Registration Number</b>	<b>Registration Date</b>
CIVIL MAPS, IC9 and IC42	Canada	TMA1074874	3/12/20
CIVIL MAPS, IC9 and IC42	United States	5392335	1/30/18
CIVIL MAPS, IC9 and IC42	Madrid System for the Int'l Registration of Marks	1307722	6/27/16
COGNITION FOR CARS	Canada	1074675	3/10/20
COGNITION FOR CARS	United States	5394360	2/6/18
COGNITION FOR CARS	Madrid System for the Int'l Registration of Marks	1360877	7/11/17

**Trademark Applications**

<b>Mark</b>	<b>Jurisdiction</b>	<b>ITU Status</b>	<b>Application Serial Number</b>	<b>Filing Date</b>
FINGERPRINT BASE MAP	United States		87735999	27-Dec-17
EDGE MAPPING	United States		87690402	18-Nov-17
CIVIL MAPS	Brazil		911247858	28-Jun-16
CIVIL MAPS	Brazil		911247904	28-Jun-16
COGNITION FOR CARS	United Kingdom		UK00801360877	7/11/2017
CIVIL MAPS	United Kingdom		UK00801307722	6/27/2016
COGNITION FOR CARS	India		3615783	11-Jul-17
CIVIL MAPS	India		3392039	27-Jun-16

**SCHEDULE 3**  
ASSIGNED COPYRIGHT REGISTRATIONS AND APPLICATIONS

**Copyright Registrations**

None.

**Copyright Applications**

None.