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DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

(54) Title: USING MAP INFORMATION TO SMOOTH OBJECTS GENERATED FROM SENSOR DATA

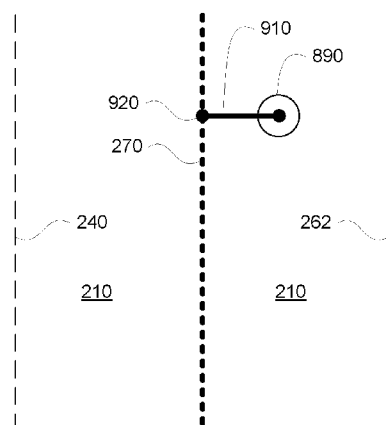


FIGURE 9

(57) Abstract: The technology relates to generating a representation of an object detected by a perception 172 system of a vehicle 100. For instance, a set of data points 790 corresponding to an object 690 is received from the perception system. Map information identifying shapes and locations of lanes as well as locations of center points for the lanes is retrieved. A representative point of the center points is selected based on the set of data points. A first position is determined based on the location of the representative point. A second position is determined based on the set of data points. The first and second positions are used to determine a third position for a representation of the object based on a distance between the first position and the second position. The representation of the object is generated using the third position. The representation of the object is displayed on a display 152 of the vehicle 100.

**Published:**

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

**(88) Date of publication of the international search report:**

28 June 2018 (28.06.2018)

## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2017/060554

A. CLASSIFICATION OF SUBJECT MATTER  
 INV. G01C21/30 B60R1/00  
 ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G01C B60R G06T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 10 2009 020300 A1 (BAYERISCHE MOTOREN WERKE AG [DE]) 11 November 2010 (2010-11-11)	1,10,11, 18
A	abstract paragraphs [0018], [0020], [0053], [0061] - [0065], [0079] - [0082]; figure 5	2,12
A	----- JP 5 787485 B2 (TOA CORP) 30 September 2015 (2015-09-30) column 47	1,2, 10-12,18
A	----- US 2014/375816 A1 (MAIHOEFER CHRISTIAN [DE]) 25 December 2014 (2014-12-25) paragraph [0009] -----	1,2, 10-12,18



Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

25 January 2018

Date of mailing of the international search report

29/05/2018

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2  
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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2017/060554

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1, 2, 10-12, 18

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1, 2, 10-12, 18

reduce or prevent large lateral shifts between generated representations for the same object

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2. claims: 3, 4, 13, 14, 19

reduce or prevent large rotations between generated representations for the same objec

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3. claims: 5, 6, 15, 16, 20

reduce or prevent shifts in size between generated representations for the same object

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4. claims: 7-9, 17

reduce the likelihood of dramatic changes in the length

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2017/060554

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102009020300 A1	11-11-2010	NONE	
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			WO 2013113348 A1 08-08-2013
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