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## PREDICTION

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IN THE RESEARCH FIELD PREDICTION:

EP3176013	PREDICTIVE SUSPENSION CONTROL FOR A VEHICLE USING A STEREO CAMERA SENSOR
EP3056861	METHOD AND SYSTEM IN A VEHICLE FOR IMPROVING PREDICTION RESULTS OF AN ADVANTAGEOUS DRIVER ASSISTANT SYSTEM
EP2942765	METHOD AND SYSTEM FOR PREDICTIVE LANE CHANGE ASSISTANCE, PROGRAM SOFTWARE PRODUCT AND VEHICLE
EP2923911	A METHOD AND SYSTEM FOR PREDICTING MOVEMENT BEHAVIOR OF A TARGET TRAFFIC OBJECT
EP2865576	COMPOSITE CONFIDENCE ESTIMATION FOR PREDICTIVE DRIVER ASSISTANT SYSTEMS
EP2845779	DRIVING ASSISTANCE TECHNIQUE FOR ACTIVE VEHICLE CONTROL
EP2840007	CONSISTENT BEHAVIOR GENERATION OF A PREDICTIVE ADVANCED DRIVER ASSISTANT SYSTEM
EP2654028	ORIENTATION SENSITIVE TRAFFIC COLLISION WARNING SYSTEM
EP2562060	A METHOD AND SYSTEM FOR PREDICTING MOVEMENT BEHAVIOR OF A TARGET TRAFFIC OBJECT

## Predictive suspension control for a vehicle using a stereo camera sensor

**EP3176013 B1**

<b>Current assignees</b> HONDA RESEARCH INSTITUTE EUROPE*		<b>IPC - International classification</b> B60G-017/0165    B60G-017/019    B62J-099/00 B62K-025/04    G06K-009/00*    H04N-013/204		
<b>Inventors</b> DEIGMÖLLER JÖRG JANSSEN HERBERT EINECKE NILS FUCHS OLIVER		<b>CPC - Cooperative classification</b> B60G-017/0165*    B60G-017/019    B60G-017/019/08 B60G-2300/12    B60G-2400/20    B60G-2400/82 B60G-2400/821    B60G-2401/14    B60G-2401/28 B60G-2500/00    B62J-045/40    B62J-045/4151 B62K-2025/044    G06K-009/00/805    H04N-013/204		
<b>Filing date:</b> 2015-12-22	<b>Granting Date:</b> 2019-07-17			

### Family

EP3176013

B1

EP3176013

A1

(EP3176013)

The invention addresses the area of predictive suspension control system for a vehicle, particularly a two-wheel vehicle such as a motor cycle or a scooter. The system for adapting a suspension includes a stereo sensor unit which for generating image data, a computing unit which extracts a relevant image portion from the image data based on future vehicle path data, and calculates road unevenness on a future vehicle path of the vehicle based on the generated image data. A suspension control unit generates an adaptation signal for adapting the suspension based on the calculated road unevenness. The computing unit adapts a search direction of a stereo algorithm or a correlation area of the stereo algorithm based on a lean angle of the vehicle to generate the three-dimensional partial image data from the relevant image portion, and fits a road model to the three-dimensional partial image data to calculate the road unevenness.

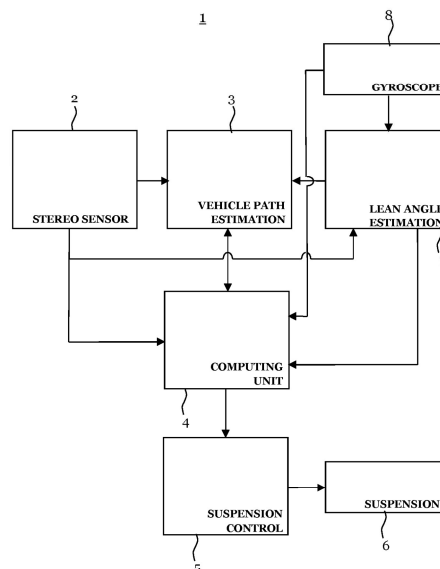


Fig. 1

**Method and system in a vehicle for improving prediction results of an advantageous driver assistant system**  
**EP3056861 B1**

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**Filing date:**

2016-02-11

**Granting Date:**

2020-04-08

**IPC - International classification**

B60W-030/095 G01C-021/00\* G01C-021/20

G01C-021/26 G01C-021/30 G01S-013/86

G01S-013/89 G01S-013/93 G01S-017/89

G06F-017/10 G06F-017/50 G06K-009/00

G08G-001/16

**CPC - Cooperative classification**

B60W-030/095\* G01C-021/20 G01C-021/30

G01S-013/86 G01S-013/89 G01S-013/93/1

G01S-017/89 G01S-2013/932 G01S-2013/9322

G01S-2013/9323 G01S-2013/93271 G06F-017/10

G06F-017/50/09 G06F-030/20 G06K-009/00/664

G06K-009/00/791 G08G-001/16/5 G08G-001/16/6

**Family**

EP3056861 B1

JP6677521 B2

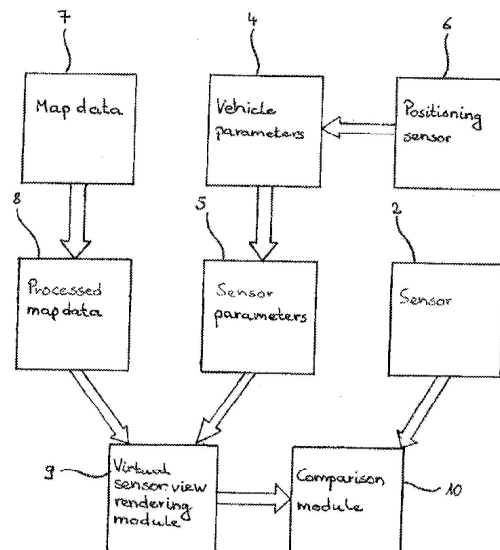
JP2016149132 A

US20160236683 A1

EP3056861 A1

The invention regards a method for improving prediction results of advanced driver assistance systems of a vehicle comprising the steps of - obtaining a map data including information about at least a road geometry in a proximity of the vehicle (S2), - assigning a sensor means for sensing a surrounding of the vehicle and being mounted on the vehicle a position and orientation in the map (S1) - generating a virtual sensing means output that corresponds to an output of the sensing means if the sensing means sensed the scene defined by the information included in the map data from the assigned position and with the orientation, wherein the generation is based on a mathematical model of the sensing means (S3), - sensing the surrounding of the vehicle and generating a sensing means output (S4) - comparing the sensing means output and the virtual sensing means output (S5) - modifying parameters of the mathematical model, generating the virtual sensing means output and comparing it with the sensing means output until a predetermined degree of fit is achieved (S1), - combining map data with information

derived from the sensing means output to generate combined information on the surrounding of the vehicle (S8) - outputting the combined information for further processing in an advanced driver assistance system (S9); and a vehicle configured to perform these method steps



## Method and system for predictive lane change assistance, program software product and vehicle

**EP2942765 B1**

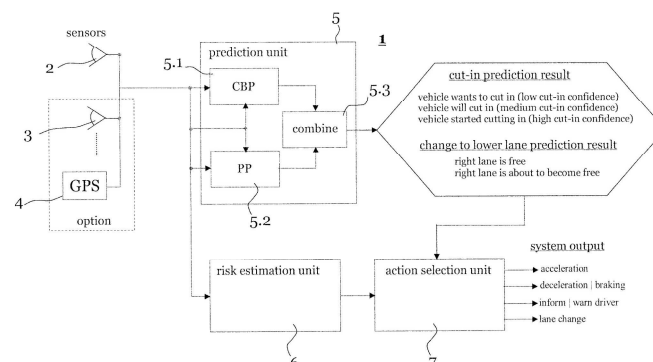
<b>Current assignees</b> HONDA RESEARCH INSTITUTE EUROPE*		<b>IPC - International classification</b> B60Q-009/00*      B60R-021/00      B60W-010/06 B60W-010/18      B60W-010/20      B60W-030/12 B60W-030/14      B60W-030/16      B60W-030/18 B60W-050/14      B62D-015/02      G01S-019/13 G08G-001/16*		
<b>Inventors</b> SCHMÜDDERICH JENS REBHAHN SVEN WEISSWANGE THOMAS KLEINEHAGENBROCK MARCUS		<b>CPC - Cooperative classification</b> B60Q-009/00      B60W-010/06      B60W-010/18 B60W-010/20      B60W-030/12      B60W-030/14 B60W-030/16      B60W-030/18/163      B60W-050/14 B60W-2420/42      B60W-2554/00      B60W-2556/50 B62D-015/02/55*      B62D-015/02/6      G01S-019/13 G08G-001/16/7		
<b>Filing date:</b> 2014-05-07	<b>Granting Date:</b> 2018-12-26	<b>PCL - US patent classification</b> <b>PCLO:</b> 701023000*		

<b>Family</b>					
JP6614777	B2	JP2015215873	A		
EP2942765	B1	US20150321699	A1		
US9669872	B2	EP2942765	A1		

(EP2942765)

The invention relates to a system and method for assisting a driver of a host vehicle in potential lane change situations, corresponding software product and vehicle. The method comprises the steps of producing sensor data by at least one sensor physically sensing the environment of the host vehicle, predicting future movement behavior of at least one sensed vehicle and determining whether a gap on a neighboring lane of the host vehicle exists. If the neighboring lane of the host vehicle would fit better for the predicted future movement behavior, a recommendation information signal regarding feasibility of a lane change of the host vehicle to this better fitting lane is generated, the feasibility being determined by computationally combining the determination result of the existence of a gap and the

predicted future movement behavior. A notification for the host vehicle's driver is output and/or, in case that a lane change is feasible, signals for performing an autonomous lane change on the basis of the recommendation information signal by the host vehicle are output.



## A method and system for predicting movement behavior of a target traffic object

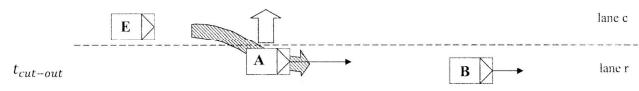
### EP2923911 B1

<b>Current assignees</b> HONDA RESEARCH INSTITUTE EUROPE*		<b>IPC - International classification</b> B60R-021/00      B60T-007/12      B60W-030/08 B60W-030/09      B60W-030/095      B60W-030/16* B60W-030/18      B60W-040/04      B60W-050/00 G05D-001/00      G06F-007/00      G06F-017/00 G08G-001/16		
<b>Inventors</b> SCHMÜDDERICH JENS		<b>CPC - Cooperative classification</b> B60W-030/09*      B60W-030/09*5/6      B60W-030/14 B60W-030/16      B60W-030/18/163      B60W-040/04 B60W-050/00/97      B60W-2530/14      B60W-2550/10 B60W-2550/30      B60W-2554/00      B60W-2554/80 B60W-2556/20      B60W-2750/30      B60W-2750/306 B60W-2754/10		
<b>Filing date:</b> 2014-03-24	<b>Granting Date:</b> 2019-03-13			

<b>Family</b>					
EP2923911	B1	JP2015182764	A		
JP6375221	B2	EP2923911	A1		
US9969388	B2	US20150266477	A1		

(EP2923911)

The invention regards a method for computationally predicting future movement behavior of a target object and program comprising the steps of producing sensor data by at least one sensor physically sensing the environment of a host vehicle, computing a plurality of movement behavior alternatives of the target object sensed by the sensors, by predicting movement behaviors of the target object applying a context based prediction step using at least one indirect indicator and/or indicator combinations derived from sensor data, wherein in said context based prediction step a probability that the target object will execute a movement behavior at a time is estimated. A future position of the target object is estimated and a signal representing the estimated future position is outputted. In the context based prediction step at least one history indicator for at least one movement behavior alternative is generated for a current point in time using at least one indicator value of an indirect indicator at a point in time in the past.



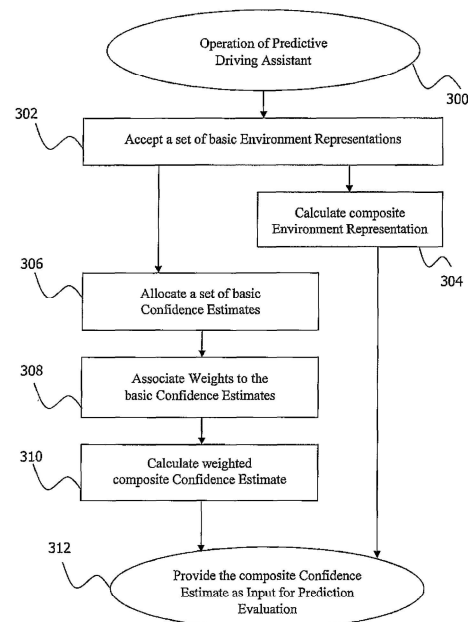
## Composite confidence estimation for predictive driver assistant systems EP2865576 B1

<b>Current assignees</b> HONDA RESEARCH INSTITUTE EUROPE*		<b>IPC - International classification</b> B60R-021/0132    B60W-030/08    B60W-030/14 B60W-030/18    B60W-040/04    B60W-050/00* G01S-013/93    G06K-009/00    G06K-009/62 G06N-005/04    G08G-001/16*		
<b>Inventors</b> SCHMÜDDERICH JENS		<b>CPC - Cooperative classification</b> B60W-030/08    B60W-030/14    B60W-030/16 B60W-030/18/163    B60W-040/04    B60W-050/00/97* B60W-2050/0022    B60W-2550/20    B60W-2554/00 B60W-2556/20    G06K-009/00/805    G06K-009/62/92 G06N-005/04		
<b>Filing date:</b> 2013-10-22	<b>Granting Date:</b> 2018-07-04	<b>PCL - US patent classification</b> <b>PCLO:</b> 701093000* <b>PCLX:</b> 701001000		

<b>Family</b>			
JP6544908	B2	EP2865576	A1
EP2865576	B1	JP2015082324	A
US9308919	B2	US20150112571	A1

(EP2865576)

The invention relates to a driving assistance system (100) including a prediction subsystem (110) in a vehicle. According to a method aspect of the invention, the method comprises the steps of accepting a set of basic environment representations (120); allocating a set of basic confidence estimates (122); associating weights to the basic confidence estimates (122); calculating (128) a weighted composite confidence estimate for a composite environment representation; and providing the weighted composite confidence estimate as input for an evaluation of a prediction (130, 132) based on the composite environment representation.



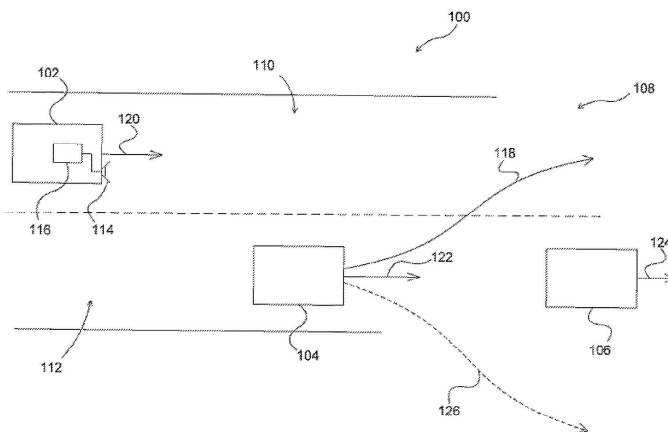
## Driving assistance technique for active vehicle control EP2845779 B1

<b>Current assignees</b> HONDA RESEARCH INSTITUTE EUROPE*		<b>IPC - International classification</b> B60R-021/00      B60W-010/184      B60W-010/20 B60W-030/095*      B60W-030/12      B60W-030/14 B60W-030/16      B60W-030/18      B60W-040/04 B60W-050/00      B62D-006/00      G08G-001/16		
<b>Inventors</b> REBHAN SVEN DR SCHMÜDDERICH JENS KLEINEHAGENBROCK MARCUS KASTNER ROBERT MORI NAOKI KUSUHARA SHUNSUKE KAMIYA HIROYUKI		<b>CPC - Cooperative classification</b> B60W-010/184      B60W-010/20      B60W-030/095/6 B60W-030/12      B60W-030/14      B60W-030/16 B60W-030/18/163      B60W-040/04      B60W-050/00/97 B60W-2556/20      B60W-2710/207      B60W-2720/10 B60W-2720/106      B62D-006/00*		
<b>Filing date:</b> 2013-09-09	<b>Granting Date:</b> 2018-08-01	<b>PCL - US patent classification</b> <b>PCLO:</b> 701041000* <b>PCLX:</b> 701001000      701093000		

<b>Family</b>					
JP6822752	B2	JP2015051761	A		
US10625776	B2	US20150073662	A1		
EP2845779	B1	EP2845779	A1		

(EP2845779)

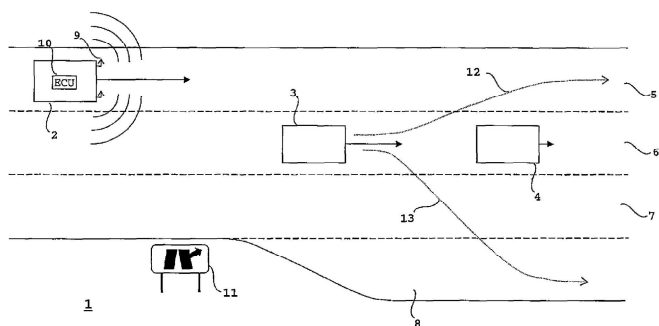
The invention relates to a driving assistant (116) adapted for active control of a vehicle (102) based on predictions of a behavior of a detected object (104). A method aspect of the invention comprises accepting a first prediction of a behavior associated with the detected object (104) from a first prediction subsystem and a second prediction from a second prediction subsystem; determining a control signal based on a combination of the first prediction and the second prediction; and initiating active control of the vehicle (102) based on the control signal.



<b><u>Current assignees</u></b>		<b><u>IPC - International classification</u></b>		
HONDA RESEARCH INSTITUTE EUROPE*		B60T-007/12	B60T-007/22	B60W-030/095
<b><u>Inventors</u></b>		B60W-030/14	B60W-050/00*	B60W-050/06*
REBHAN SVEN		B62D-006/00	G08G-001/16	
<b><u>Filing date:</u></b>		<b><u>CPC - Cooperative classification</u></b>		
<b><u>Granting Date:</u></b>		B60T-007/12	B60T-007/22	B60T-2201/024
2013-08-22	2018-04-04	B60W-030/095	B60W-030/14/3	B60W-050/00/97*
		B60W-050/06	B60W-2050/0056	B60W-2550/302
		B60W-2550/308	B60W-2554/801	B60W-2554/804

JP6404634	B2	JP2015061776	A
EP2840007	B1	US20150057907	A1
US9463806	B2	EP2840007	A1

The invention relates to a driver assistance system and method for a vehicle (2), the vehicle comprising at least one sensor means (9), at least one actuating means (32) and a control means (10). The method comprises the steps of - generating a decision signal (14) by a first evaluation of sensor data (38) acquired by the sensor means (9); - generating an activation signal (23) for the actuating means (32) when the decision signal (14) exceeds a signal threshold (15); - stabilizing the activation signal (23) in a temporal manner; - generating a interrupt decision signal (28) based on a second evaluation; - deciding based on the decision interrupt signal (28) if to interrupt stabilizing the activation signal (23); and - interrupting stabilizing the activation signal (23), when it is decided to interrupt stabilizing the activation signal, thus creating a reliable stabilized activation signal (27).



## Orientation sensitive traffic collision warning system EP2654028 B1

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### Filing date:

2012-04-20

### Granting Date:

2018-09-26

### IPC - International classification

B60R-021/00      B60W-030/095      G06K-009/00  
G08G-001/16\*

### CPC - Cooperative classification

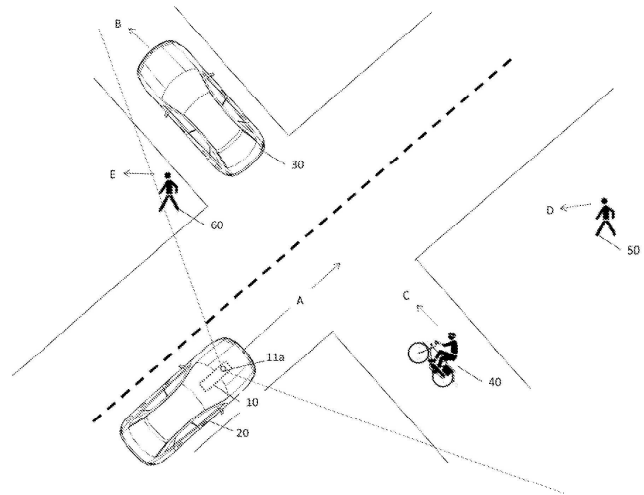
B60W-030/095      G06K-009/00/791      G06K-009/00/805  
G08G-001/16\*      G08G-001/16\*/5      G08G-001/16\*/6

### Family

EP2654028	B1	JP2013225295	A
US9524643	B2	US20130282268	A1
JP5938569	B2	EP2654028	A1

(EP2654028)

The present invention provides an Advanced Driver Assistant System (ADAS) 10 and an operating method thereof, which work on long time scales, and guide an ego vehicle 20 away from upcoming risks, rather than only reacting to risks to mitigate the consequences of a crash. To this end, information comprising the orientation of other traffic participants 30, 40, 50, 60, a free driving area of the ego vehicle 20, and/or a driving trajectory of the vehicle 20 as intended by the driver is taken into account, in order to determine potential risks.



## A method and system for predicting movement behavior of a target traffic object

### EP2562060 B1

<b>Current assignees</b> HONDA RESEARCH INSTITUTE EUROPE*		<b>IPC - International classification</b> B60R-021/00      B60W-030/095*      B60W-030/16 B60W-050/00      G06F-007/00      G06F-017/10 G06K-009/00      G06K-009/46      G06K-009/62 G06Q-010/04      G08G-001/16*		
<b>Inventors</b> SCHMÜDDERICH DR JENS REBHAN SVEN		<b>CPC - Cooperative classification</b> B60W-030/095/6*      B60W-030/16      B60W-050/00/97 B60W-2554/4042      B60W-2554/4043      G06K-009/00/798 G06K-009/00/805      G06K-009/62/93      Y02T-010/84		
<b>Filing date:</b> 2011-08-22	<b>Granting Date:</b> 2014-10-01	<b>PCL - US patent classification</b> <b>PCLO:</b> 701023000* <b>PCLX:</b> 701096000      701301000		

<b>Family</b>					
US8903588	B2	JP2013045447	A		
EP2562060	B1	US20130054106	A1		
JP5580852	B2	EP2562060	A1		

(EP2562060)

The invention proposes a method for computationally predicting future movement behaviors of at least one target object, such as e.g. vehicle, comprising the steps of: - Producing sensor data by at least one sensor physically sensing the environment of a host vehicle, - computing a plurality of movement behavior alternatives of a target object sensed by the sensor(s), by predicting movement behaviors of the traffic target vehicle applying a context based prediction step using indirect indicators and/or indicator combinations derived from said sensor data, wherein said context based prediction step uses a set of classifiers, each classifier estimating a probability that said sensed target object will execute a movement behavior at a time, wherein the probability is calculated based on a feature vector calculated for each classifier, - validating the movement behavior alternatives by a physical prediction comparing measured points with trajectories of situation models and determining at least one trajectory indicating at least one possible behavior of the traffic participant, wherein the at least one movement behavior is a sub-set of the possible movement behavior alternatives, and - estimating at least one future position of the traffic participant based on the at least one trajectory, - outputting a signal representing the estimate future position.

