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PERCEPTION

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EP2873314	CONTROL SYSTEM FOR AN AUTONOMOUS GARDEN TOOL, METHOD AND APPARATUS
EP2757524	DEPTH SENSING METHOD AND SYSTEM FOR AUTONOMOUS VEHICLES
EP2701093	SENSING SYSTEM AND METHOD FOR DETECTING MOVING OBJECTS
EP2654028	ORIENTATION SENSITIVE TRAFFIC COLLISION WARNING SYSTEM
EP2620050	SYSTEM, METHOD AND APPARATUS FOR UNSUPERVISED ADAPTION OF THE PERCEPTION OF AN AUTONOMOUS LAWN MOWER

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HONDA

Method and system for privacy compliant data recording
EP3514760 B1

Current assignees

HONDA RESEARCH INSTITUTE EUROPE*

Inventors

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RICHTER ANDREAS

FUCHS STEFAN

KNORZ CHRISTIANE

Filing date: 2018-01-23

Granting Date: 2020-06-17

IPC - International classification

G06F-021/60	G06F-021/62	G06K-009/00
G06K-019/07	G06T-007/00	G06T-011/60*
H04L-009/06	H04L-009/14	H04N-005/232
H04N-005/77		

CPC - Cooperative classification

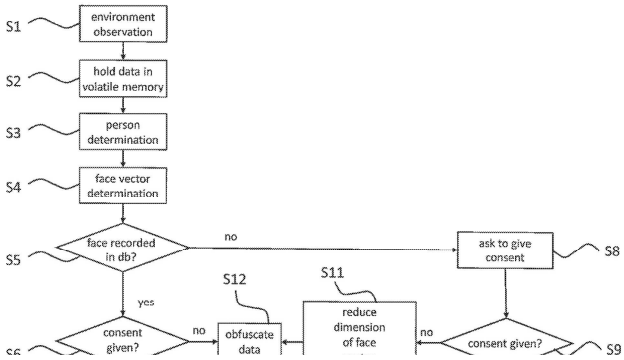
G06F-021/60/2	G06F-021/60/4	G06F-021/62/54*
G06K-009/00/288	G06K-019/07/23	G06T-011/60

Family

EP3514760	B1	US20190228182	A1
JP2019165431	A	EP3514760	A1

(EP3514760)

The invention regards a method and system for recording observation data without violating privacy. Environment is sensed and observation data including information on the sensed environment is generated (S1). The observation data is processed for determining presence of one or more persons in the sensed environment (S3). Those person(s) amongst the present person(s) that did not agree to store their private data (S4, S5) are identified and privacy compliant observation data is generated by obfuscating the private data of these persons (S7). The privacy compliant observation data (S13) is store for later use.



Honda Research Institute EU

HONDA

Navigation system based on slow feature gradients
EP3367061 B1

Current assignees

HONDA RESEARCH INSTITUTE EUROPE*

Inventors

FRANZIUS MATHIAS

METKA BENJAMIN

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Filing date: 2018-02-28

Granting Date: 2020-07-15

IPC - International classification

G01C-021/20* G05D-001/02*

CPC - Cooperative classification

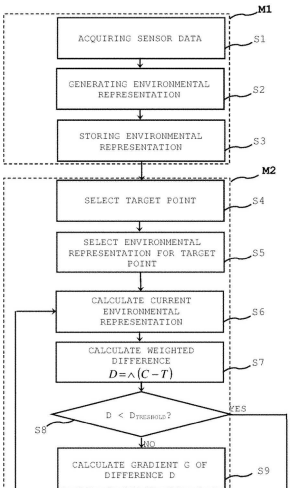
G01C-021/20 G05D-001/02/21*

Family

US10955852	B2	US20180246516	A1
EP3367061	B1	EP3367061	A1

(EP3367061)

The invention relates to the field of navigation for mobile systems. The invention proposes a method for navigating a mobile system and corresponding mobile system, in particular for autonomous mobile systems such as robots, for example lawn mowers or even smartphones. The mobile device comprises at least one sensor, an electronic control unit and an output unit. The method comprises a step of acquiring sensor data on an environment of the mobile device, a step of calculating a gradient of a difference of a target environmental representation and a current environmental representation, a step of determining a movement direction to reach a target position corresponding to the target environmental representation based on the estimated gradient. In an output step, the determined movement direction for navigating the mobile device is output, for example to a steering system of the mobile device or to a display. Advantageously, the method comprises a step of generating an environmental representation by performing unsupervised learning from the acquired sensor data.



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HONDA

Robotic gardening device and method for controlling the same
EP3298874 B1

Current assignees

HONDA RESEARCH INSTITUTE EUROPE*

Inventors

FRANZIUS MATHIAS

EINECKE NILS

Filing date:
2016-09-22

Granting Date:
2020-07-01

IPC - International classification

A01D-034/00*	A01D-075/18	B60W-030/00
G05D-001/02	G06K-009/00	G06K-009/62
G06N-020/00	G06T-007/20	G06T-007/73

CPC - Cooperative classification

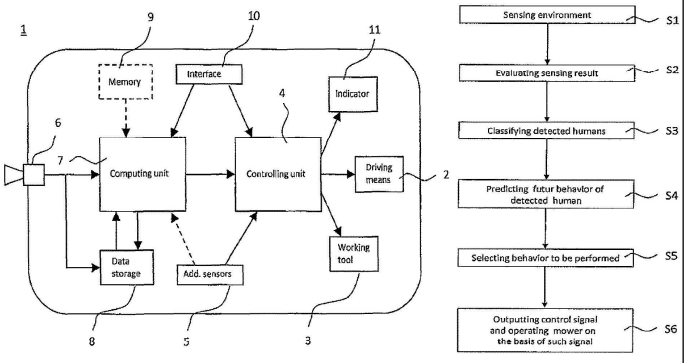
A01D-034/00/8*	A01D-075/18/5	B60W-030/00
G05D-001/02/46	G05D-2201/0208	G06K-009/00/362
G06K-009/00/664	G06K-009/62/12	G06N-020/00
G06N-099/00/5	G06T-007/20	G06T-007/75
G06T-2207/20081		

Family

US10912253	B2	EP3298874	A1
EP3298874	B1	US20180077860	A1

(EP3298874)

The invention regards a robotic gardening device comprising driving means (2) for propelling the robotic gardening device, a working tool (3) for performing dedicated gardening work and a controlling unit (4) for controlling said driving means (2) and the working tool (3) and a method for controlling the same. The robotic gardening device further comprises at least one environment sensor (6) generating a signal indicative of objects in the environment of the robotic gardening device, a computing unit (7) for classifying these objects, wherein the classes comprise at least two different classes for objects being determined to be humans. The computing unit (7) is configured to control the driving means (2) and/or the working device (3) according to a predetermined behavior associated with the respective objects class.



Honda Research Institute EU

HONDA

Navigation system and method for error correction
EP3236210 B1

Current assignees

HONDA RESEARCH INSTITUTE EUROPE*

Inventors

STEINHARDT NICO

Filing date: 2016-06-27

Granting Date: 2020-08-05

IPC - International classification

G01C-021/16* G01S-019/47 G01S-019/49

CPC - Cooperative classification

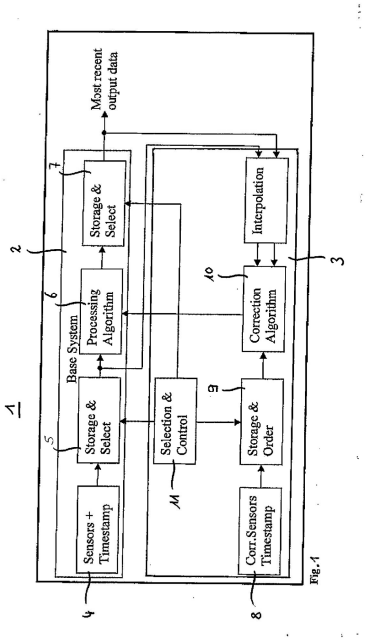
G01C-021/16/5* G01S-019/47 G01S-019/49

Family

EP3236210 B1 EP3236210 A1

(EP3236210)

Method and system for correcting errors of a measurement system output, wherein the system comprises a base measurement system and a correction system. Base measurement system sensor data is acquired and the data is provided to a processing algorithm. The data is also stored associated with the time stamp indicating the time of sensing. By the processing algorithm, output values are calculated and the calculated output values are also stored with time stamps indicating the time of the sensor data based on which the output values are calculated. The sensor data, the output values and correction system sensor data having corresponding time stamps of supplied to a fusion filter where correction values and correction increments are calculated. The correction increments reflect the change of an error in a base system output value over time due to integration and/or summing up base system sensor data errors in the processing algorithm. The respective correction values are applied to the base system sensor data and by re-computation by the processing algorithm, corrected base navigation output values are calculated. These output values are then further corrected by the correction increments, thus taking care of the errors changing over time. The most reasoned output values of the processing algorithm are provided for further processing in succeeding applications like navigation, for example for routing purposes.



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HONDA

Autonomous working machine such as autonomous lawn mower

EP3187953 B1

Current assignees

HONDA RESEARCH INSTITUTE EUROPE*

Inventors

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DEIGMÖLLER JÖRG

Filing date:
2015-12-30

Granting Date:
2020-03-18

IPC - International classification

A01D-034/00*	A01D-101/00	B60R-011/04
G05B-015/00	G05B-019/00	G05D-001/02
G06K-009/00	G06T-007/70	H04N-007/18
H04N-013/204		

CPC - Cooperative classification

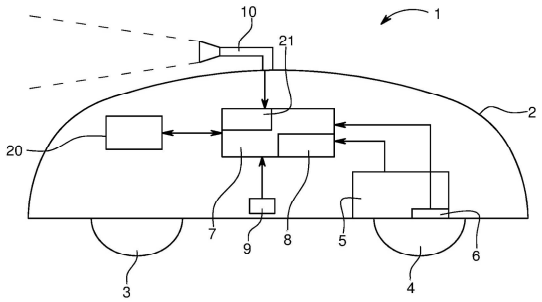
A01D-034/00/8*	A01D-2101/00	B60R-011/04
G05D-001/02/51	G05D-001/02/53	G05D-001/02/7
G05D-001/02/72	G05D-2201/0208	G06K-009/00/791
G06T-007/70	G06T-2207/10012	G06T-2207/30252
H04N-007/18/3	H04N-013/02/03	H04N-013/204

Family

EP3187953	B1	US20170188510	A1
US10321625	B2	EP3187953	A1

(EP3187953)

The invention regards an autonomous working machine comprising drive means, current position estimation means, control means including a driving control unit and a camera. With aid of the current position estimation means the current position of the autonomous working machine is estimated. Furthermore, the driving control unit generates driving commands for the driving means on the basis of an intended movement of the autonomous working machine and the estimated current position. The camera is configured to capture images of the environment of the working machine. For estimating the current position, the current position estimation means is formed by the control means, which is configured to apply visual odometry on the captured images for estimating the current position of the working machine.



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HONDA

Predictive suspension control for a vehicle using a stereo camera sensor

EP3176013 B1

Current assignees

HONDA RESEARCH INSTITUTE EUROPE*

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FUCHS OLIVER

Filing date: 2015-12-22

Granting Date: 2019-07-17

IPC - International classification

B60G-017/0165	B60G-017/019	B62J-099/00
B62K-025/04	G06K-009/00*	H04N-013/204

CPC - Cooperative classification

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

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.

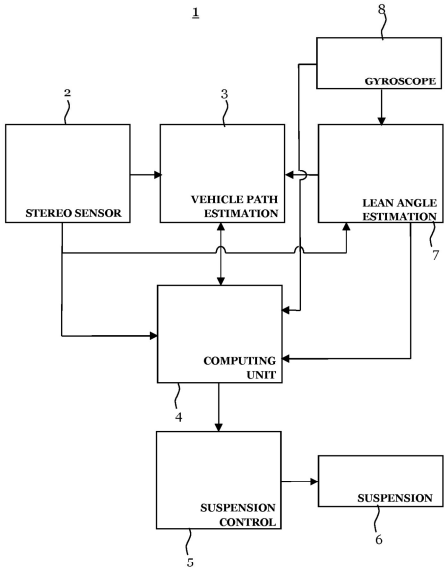

Fig. 1

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HONDA

Autonomous vehicle with improved simultaneous localization and mapping function
EP3156873 B1

Current assignees

HONDA RESEARCH INSTITUTE EUROPE*

Inventors

FRANZIUS MATHIAS

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Filing date: 2015-10-15

Granting Date: 2019-12-04

IPC - International classification

A01D-034/00 G05D-001/00 G05D-001/02*

CPC - Cooperative classification

G05D-001/00/88* G05D-001/02/19 G05D-001/02/51

G05D-001/02/65 G05D-001/02/7 G05D-001/02/74

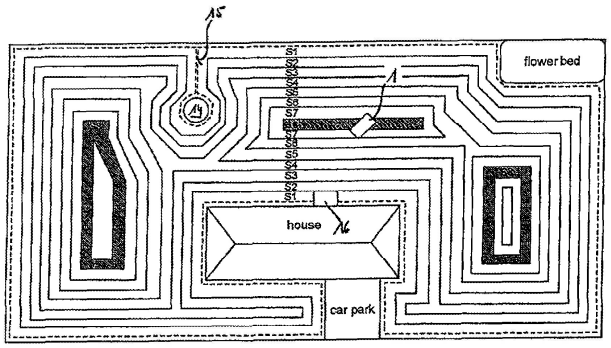
G05D-2201/0208

Family

EP3156873	B1	US20170108867	A1
US10191488	B2	EP3156873	A1

(EP3156873)

The invention relates to an autonomous vehicle comprising a driving means and a system including such autonomous vehicle. The autonomous vehicle furthermore comprises at least one environment sensing means (10, 11) for sensing an environment of the autonomous vehicle (1). It furthermore comprises a computing unit (7) configured to perform a mapping function and a localization function. The mapping function is performed on the basis of respective signals supplied from the at least one environment sensing means (10, 11) to build up a map. The localization function localizes the autonomous vehicle (1) within the map and generates respective localization information, The autonomous vehicle (1) further comprises a boundary distance sensing means (12, 13) configured to generate a distance signal correlated to a distance between the autonomous vehicle and a boundary indication means (15). The computing unit (7) is configured to receive the distance signal and to perform at least one of the mapping function and the localization function on the basis of a signal from the at least one environment sensing means (10, 11) and the distance signal from the boundary distance sensing means (12, 13). The system comprises in addition to the autonomous vehicle a boundary wire indicating a border of an entire area in which autonomous driving of the autonomous vehicle (1) shall be performed.



Honda Research Institute EU

HONDA

System and method for assisting reductive shaping of plants into a desired 3d-shape by removing material

EP3085223 B1

Current assignees

HONDA RESEARCH INSTITUTE EUROPE*

Inventors

FRANZIUS MATHIAS

Filing date: 2015-04-20

Granting Date: 2017-12-20

IPC - International classification

A01G-003/04*	B25F-005/00*	B26B-029/06
B27G-019/06	G05B-019/18	

CPC - Cooperative classification

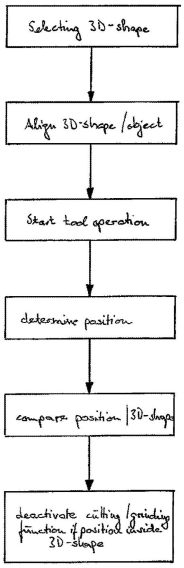
A01G-003/04/35	A01G-003/047	B26B-029/06*
G05B-019/18/2	G05B-2219/35318	G05B-2219/37095

Family

JP6747853	B2	JP2016202171	A
US10131065	B2	US20160311124	A1
EP3085223	B1	EP3085223	A1

(EP3085223)

The invention regards a system and method for assisting reductive shaping of an object into a desired 3D-shape by removing material. The system comprises a tool and a localization means. The tool is configured to remove material from an object by means of a cutting function or a grinding function performed by a working head of the tool. The localization means determines a position of the working head relative to the desired 3D-shape. Each time the grinding function or cutting function would remove material from an inside of the desired 3D-shape the cutting or grinding function is deactivated.



Honda Research Institute EU

HONDA

Method and system for adaptive ray based scene analysis of semantic traffic spaces and vehicle equipped with such system

EP3032454 B1

Current assignees

HONDA RESEARCH INSTITUTE EUROPE*

Inventors

FRITSCH JANNIK

WEISSWANGE THOMAS

Filing date: 2014-12-10

Granting Date: 2018-09-26

IPC - International classification

G06K-009/00 G06K-009/46* G06K-009/62

G06T-007/00 G08G-001/16*

CPC - Cooperative classification

G06K-009/00/536 G06K-009/00/791 G06K-009/00/798

G06K-009/00/805* G06K-009/00/825 G06K-009/46

G06K-009/62/67 G06K-2209/23

PCL - US patent classification

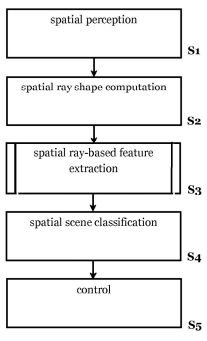
PCLO: 382104000*

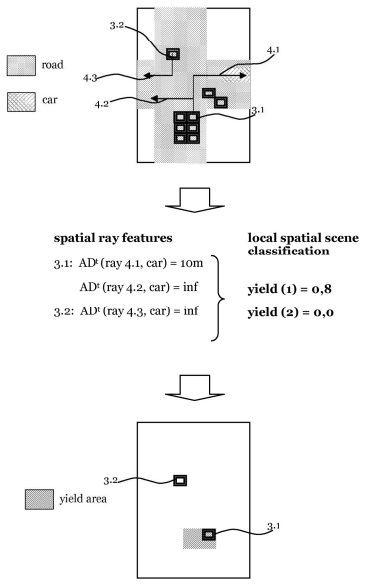
Family

JP6591842	B2	JP2016115334	A
EP3032454	B1	US20160171316	A1
US9767368	B2	EP3032454	A1

(EP3032454)

The invention is in the field of automated computerized driver assistance for vehicles. The invention regards in particular a method and a system for computationally performing scene analysis of semantic traffic spaces based on an adaptive spatio-temporal ray-based approach. The method for spatial analysis of a traffic scene comprises a step of acquiring a spatial semantic environment map including semantic context data, a step of calculating at least one feature for at least one location on the spatial environment map taking into account the semantic context of the location and a step of determining a category for the at least one location based on the at least one calculated feature. In an embodiment the feature is a ray based feature calculated by integrating input values along at least one ray extending in least one of a space dimension and a time dimension. The ray may have a ray shape corresponding to a general shape of a road and/or the at least one spatially extending ray follows a course of the road and/or is perpendicular to a surrounding road segment orientation.





Honda Research Institute EU

HONDA

Sensor system for determining distance information based on stereoscopic images

EP2960858 B1

Current assignees

HONDA RESEARCH INSTITUTE EUROPE*

Inventors

EINECKE NILS

Filing date: 2014-06-25

Granting Date: 2018-08-08

IPC - International classification

G01B-011/02	G01B-011/22	G01C-003/06
G06K-009/00	G06T-007/00*	G06T-007/593*

CPC - Cooperative classification

G01B-011/02/6*	G06K-009/00/791	G06T-007/00/67
G06T-007/00/75	G06T-007/564	G06T-007/593
G06T-2207/10012	G06T-2207/10021	G06T-2207/30252

PCL - US patent classification

PCLO: 382104000*

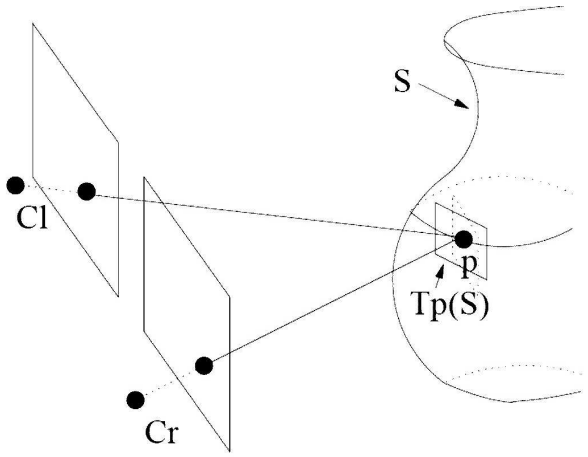
PCLX: 382106000

Family

JP6574611	B2	JP2016009487	A
EP2960858	B1	US20150377607	A1
US9513108	B2	EP2960858	A1

(EP2960858)

The invention provides a distance measurement method determining the distance of a sensor system to a physical object, comprising the steps of obtaining, from the sensor system, at least a pair of stereoscopic images including the physical object, applying to each element of at least a portion of a first image of the pair of stereoscopic images and to each element of at least a portion of a second image of the pair of stereoscopic images at least two differently shaped and/or sized filters, respectively, determining correlation values for each filter applied to the first and second image, determining combined correlation values for the applied filters by combining the determined correlation values for each applied filter, evaluating the combined correlation values for different disparities for an extremum value of the combined correlation values, calculating a distance value of the sensor system to the physical object based on a disparity value at which the extremum occurs, and outputting the distance value.



Honda Research Institute EU

HONDA

Method, system, imaging device, movable device and program product for detecting static elements in video and image sources

EP2899692 B1

Current assignees

HONDA RESEARCH INSTITUTE EUROPE*

Inventors

EINECKE NILS

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Filing date: 2014-01-28

Granting Date: 2019-09-04

IPC - International classification

B60S-001/08	G01N-021/94	G01N-021/958
G06K-009/00	G06K-009/52	G06T-001/00
G06T-007/20	G06T-007/215	G06T-007/269*
H04N-005/217	H04N-007/18	

CPC - Cooperative classification

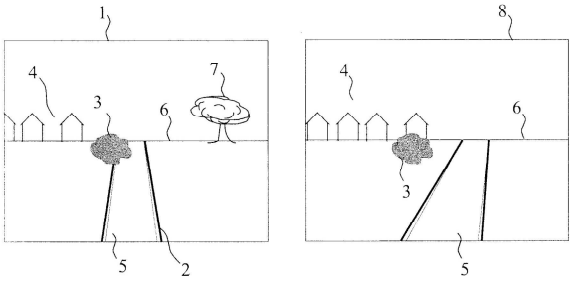
B60S-001/08/18	B60S-001/56	G01N-021/94
G01N-021/958	G01N-2021/945	G06K-009/00/791*
G06K-009/52	G06T-007/20/06	G06T-007/20/13
G06T-007/20/53	G06T-007/215	G06T-007/269
G06T-2207/10016	G06T-2207/30252	H04N-005/217/1

Family

EP2899692	B1	JP2015156212	A
JP6018231	B2	US20150213318	A1
US9454703	B2	EP2899692	A1

(EP2899692)

The invention relates to a method for determining a static element in images captured by an imaging means mounted on a movable device. The method comprises steps of acquiring a first image and a second image captured by the imaging means,. The first image and the second image are captured at capture times separated by a time difference and the method is characterized by the time difference being selected depending on motion parameters of the movable device. A determination measure for corresponding regions of the first and the second image for representing a similarity of the corresponding regions is calculated and a static element of the first and the second image is determined based on the calculated determination measure. An output signal comprising information on the determined static element is generated.



Honda Research Institute EU

HONDA

Method for analyzing related images, image processing system, vehicle comprising such system and computer program product

EP2894601 B1

Current assignees

HONDA RESEARCH INSTITUTE EUROPE*

Inventors

EINECKE NILS

Filing date: 2014-01-10

Granting Date: 2020-07-01

IPC - International classification

G06K-009/00	G06K-009/62	G06T-001/00
G06T-007/00	G06T-007/32	G06T-007/579
G06T-007/593*	G08G-001/16	

CPC - Cooperative classification

G06K-009/00/791	G06K-009/62/02	G06T-007/00/26
G06T-007/00/71	G06T-007/00/75	G06T-007/32*
G06T-007/579	G06T-007/593	G06T-2207/10028
G06T-2207/20076	G06T-2207/30252	G06T-2207/30256

PCL - US patent classification

PCLO: 382104000*

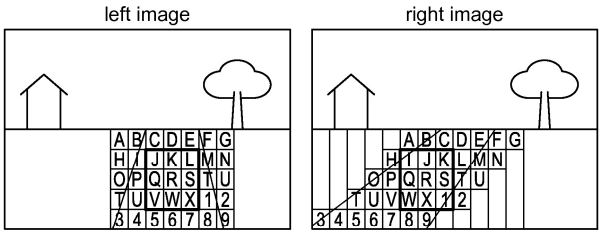
PCLX: 382154000

Family

EP2894601	B1	JP2015133108	A
JP6407010	B2	US20150199818	A1
US9672635	B2	EP2894601	A1

(EP2894601)

The invention relates to a method for analyzing related images corresponding system and vehicle including such system as well as a computer program product for executing the method which comprises the steps of: - obtaining at least a first and a second image - defining a pixel patch in the first image for which a correlation shall be calculated - calculating matching cost values between each pixel of the pixel patch in the first image and its corresponding pixel in each of a plurality of pixel patches in the second image, wherein the pixel patches in the second image differ in position in the second image and include the pixel patch with a target position - aggregating the matching cost values of those corresponding pixels of all patches in the second image which match best to generate an aggregation window associated with the target position and - producing a signal including information on the target position.



Honda Research Institute EU

HONDA

Control system for an autonomous garden tool, method and apparatus
EP2873314 B1

Current assignees

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IPC - International classification

A01D-034/00*	B60L-011/18	H04N-005/232
H04N-005/235*		

CPC - Cooperative classification

A01D-034/00/8	B60L-011/18/38	B60L-2200/22
B60L-2260/32	G05D-001/02/46	G05D-2201/0208
H04N-005/232/29	H04N-005/232/45	H04N-005/235/5*
Y02T-010/70	Y02T-010/7005	Y02T-010/7072
Y02T-090/12	Y02T-090/121	Y02T-090/128
Y02T-090/14	Y02T-090/16	Y02T-090/163

PCL - US patent classification

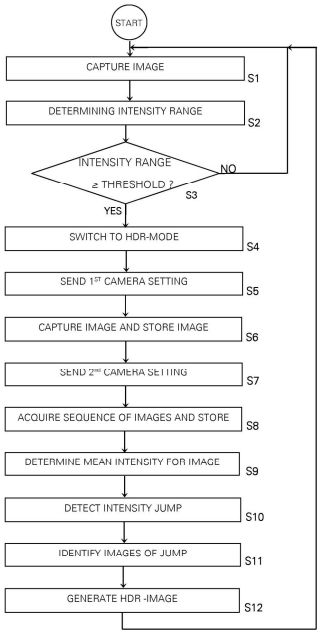
PCLO: 348118000*

Family

US9883114	B2	US20150138339	A1
EP2873314	B1	EP2873314	A1

(EP2873314)

The invention relates to a control system for an autonomous garden tool that is equipped with at least one camera and one motor. The control system comprises a camera control module and an image generation module. With the camera control module the camera settings are controlled that are used for capturing images. With the image generation module two consecutive images in a sequence of images that is captured by the camera is determined whereby theses two consecutive images are captured on the basis of different camera settings. The two determined pictures are used as a basis for generating an HDR image in an HDR mode of the control system.



Honda Research Institute EU

HONDA

Depth sensing method and system for autonomous vehicles

EP2757524 B1

Current assignees

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Filing date: 2013-01-16

Granting Date: 2018-12-12

IPC - International classification

B60R-021/00	G06K-009/00	G06T-001/00
G06T-005/00*	G06T-007/593	H04N-007/18
H04N-013/02	H04N-013/128	

CPC - Cooperative classification

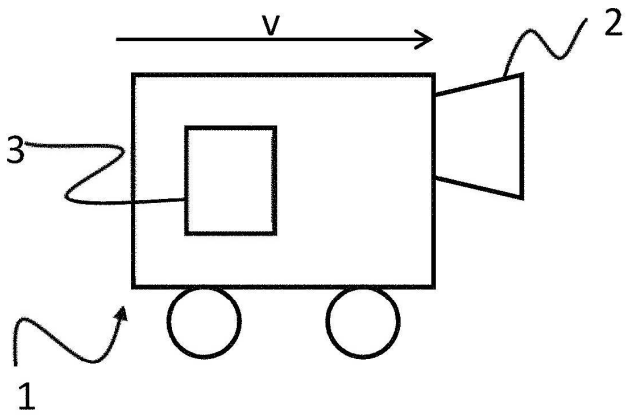
G06K-009/00/805	G06T-005/00/6	G06T-007/593
G06T-2207/10012	G06T-2207/30261	H04N-013/00/22*
H04N-013/128*		

Family

EP2757524	B1	US20140225990	A1
US10129521	B2	JP2014138420	A
JP5926228	B2	EP2757524	A1

(EP2757524)

In one aspect, an image processing method for processing images is provided, comprising the steps of: obtaining, from an optical sensor, at least two images, , determining an image warping function at least partially compensating the distortion, applying the determined image warping function to the image including the distortion, and calculating by a processing unit, and outputting, a depth and/or disparity image from the at least two images.



Honda Research Institute EU

HONDA

Sensing system and method for detecting moving objects

EP2701093 B1

Current assignees

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Filing date: 2012-08-20

Granting Date: 2016-06-22

IPC - International classification

G06K-009/00* G06T-007/20 G08G-001/16

H04N-007/18*

CPC - Cooperative classification

G06K-009/00/624 G06K-009/00/805 G06T-007/20

G06T-007/20/06 G06T-007/215 G06T-2207/10016

G06T-2207/30252 G06T-2207/30261 H04N-007/18*

PCL - US patent classification

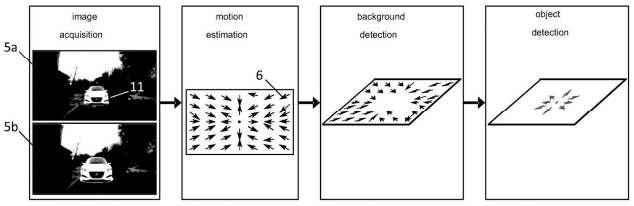
PCLO: 348148000*

Family

US9516274	B2	JP2014038611	A
EP2701093	B1	EP2701093	A1
JP5678147	B2	US20140049644	A1

(EP2701093)

The present invention presents a sensing system 1 and a corresponding method for detecting moving objects 11 in the surroundings of a vehicle 10. The sensing system 1 comprises an imaging unit 2 for obtaining an image stream 2a, a computing unit 3 for analyzing the image stream 2a, and a control unit 4 for controlling the vehicle 10 based on the analysis result of the computing unit 3. The sensing system 1 particularly employs a background-model-free estimation. The sensing system 1 is configured to perform a local analysis of two neighboring motion vectors 6, which are computed from points 7a in images 5a, 5b of the image stream 2a, and to determine, whether the points 7a corresponding to these motion vectors 6 belong to a particularly moving object.



Honda Research Institute EU

HONDA

Orientation sensitive traffic collision warning system
EP2654028 B1

Current assignees

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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

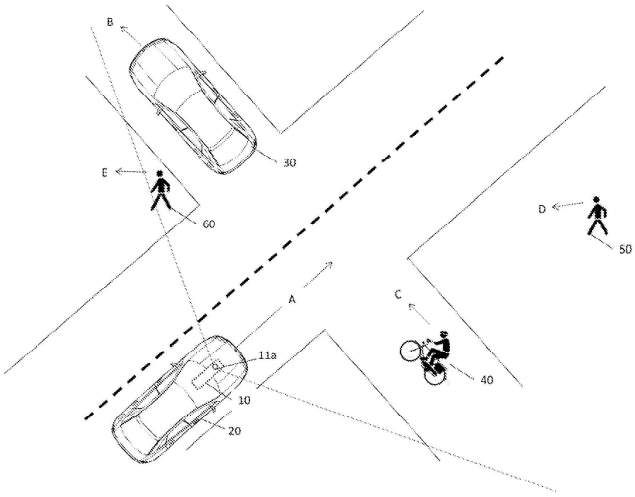
B60W-030/095	G06K-009/00/791	G06K-009/00/805
G08G-001/16*	G08G-001/16*/5	G08G-001/16*/6

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.



Honda Research Institute EU

HONDA

System, method and apparatus for unsupervised adaptation of the perception of an autonomous mower

EP2620050 B1

Current assignees

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Granting Date: 2016-07-27

IPC - International classification

A01B-069/00*	A01D-034/00	A01D-034/04
A01D-034/64	G01C-022/00	G03B-007/093
G03B-007/095	G03B-007/16	G03B-015/02
G03B-017/00	G03B-017/02	G05D-001/02
H04N-005/238	H04N-005/243	

CPC - Cooperative classification

A01B-069/00/1	A01D-034/00	A01D-034/00/8*
A01D-034/04	G05D-001/02/21	G05D-001/02/46
G05D-001/02/74	G05D-2201/0208	G06K-009/00/664

PCL - US patent classification

PCLO: 701028000*

PCLX: 037243000 700245000

Family

EP2620050	B1	JP2013153413	A
US8958939	B2	EP2620050	A1
JP5529947	B2	US20130190965	A1

(EP2620050)

The present invention presents a method and system for an autonomous mower attached with a camera, wherein the control of the parameters of the camera and the control of the mower movement and grass detection are optimized holistically during operation. The present invention mitigates the camera sensing limits by adapting the movement speed of the mower. Furthermore, the camera control optimizes the visibility of grass by using the grass mask of a grass segmentation to calculate updated exposure, gain and aperture values only from grass pixels. The grass segmentation tracks changes in the grass color that are caused by illumination differences. Optionally, the system is equipped with a head light used to further improve the camera signal quality in conjunction with the control of the camera parameters and the movement speed of the mower.