



EUROPEAN PATENT APPLICATION

(43) Date of publication:
04.12.2019 Bulletin 2019/49

(51) Int Cl.:
G08G 1/16 (2006.01)

(21) Application number: **18175202.3**

(22) Date of filing: **30.05.2018**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(54) **METHOD FOR A HOST VEHICLE TO ASSESS RISK OF OVERTAKING A TARGET VEHICLE ON A PEDESTRIAN CROSSING**

(57) A risk evaluation system for a host vehicle (10) for assessing the risk of overtaking a target vehicle (12) on a pedestrian crossing (14) comprises, an object detector means (30) configured to detect a pedestrian crossing (14) and to detect a target vehicle (12) in the front field of view of the host vehicle (10); a controller (48) in communication with the object detector means (30), wherein the controller is configured to determine the pedestrian crossing location (50) and to determine the target vehicle driving behavior (54); the controller (48) is further configured to detect a deceleration of the target

vehicle (12); to evaluate a target vehicle stop distance (SD_t) between the target vehicle (12) and the pedestrian crossing (14) based on the target vehicle speed if the target vehicle (12) has been detected in a deceleration mode; to compare the evaluated target vehicle stop distance (SD_t) with a predetermined target stop distance threshold (TSD_{th}); and to estimate a risk for the host vehicle (10) of overtaking the target vehicle (12) on the pedestrian crossing (14) based on the comparison step result of the target vehicle stop distance (SD_t).

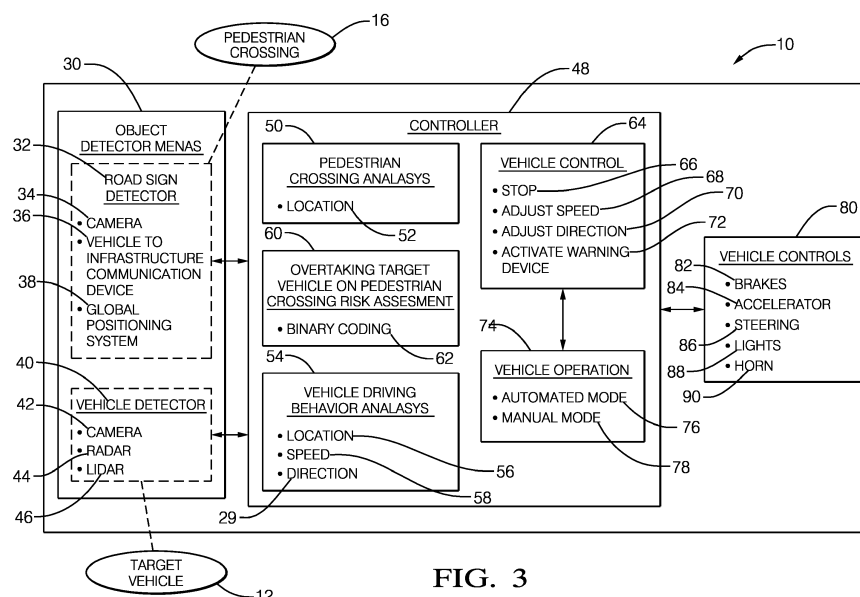


FIG. 3

Description

TECHNICAL FIELD OF THE INVENTION

[0001] The invention relates to a method for a host vehicle to assess risk of overtaking a target vehicle on a pedestrian crossing, and more particularly to assess the risk when the pedestrian crossing is partially occluded.

BACKGROUND OF THE INVENTION

[0002] Many cities all over the world are making significant effort to reduce number of fatalities on the roads, including strong focus on pedestrian safety. Overtaking on a pedestrian crossing is forbidden at least in some countries. Anyway this rule is being broken sometimes intentionally or by accident due to the driver distraction, tiredness or bad weather conditions what increases danger for road users. In countries where there is no such law regulation, the situation for pedestrian is even more critical.

[0003] It is therefore important to propose a new solution to increase safety for pedestrian.

SUMMARY OF THE INVENTION

[0004] The invention relates to a risk evaluation system for a host vehicle that assesses the risk of overtaking a target vehicle on a pedestrian crossing, said risk being a risk of hitting a pedestrian on the pedestrian crossing during the overtaking maneuver. The risk evaluation system is configured to operate when pedestrian crossing may only be partially seen by the host vehicle as the target vehicle, running toward the pedestrian crossing, partially obstructs the front field of view of the host vehicle. In such situation, the host vehicle may estimate a potential risk of the presence of a pedestrian crossing the road on the obstructed pedestrian crossing, said pedestrian cannot be seen by the host vehicle.

[0005] In accordance with one embodiment, the risk evaluation system for the host vehicle for assessing the risk of overtaking the target vehicle on a pedestrian crossing comprises, an object detector means configured to detect a pedestrian crossing and to detect the target vehicle in the front field of view of the host vehicle; a controller in communication with the object detector means, wherein the controller is configured to determine the pedestrian crossing location and to determine the target vehicle driving behavior; the controller is further configured to detect a deceleration of the target vehicle, to evaluate a target vehicle stop distance between the target vehicle and the pedestrian crossing based on the target vehicle speed if the target vehicle has been detected in a deceleration mode; to compare the evaluated target vehicle stop distance with a predetermined target stop distance threshold; to estimate a risk for the host vehicle of overtaking the target vehicle on the pedestrian crossing based on the comparison step result of the target

vehicle stop distance.

[0006] In another embodiment, a method for a host vehicle to assess risk of overtaking a target vehicle on a pedestrian crossing comprises the steps of:

detecting a pedestrian crossing on the host vehicle path;
detecting a target vehicle traveling toward the pedestrian crossing;
determining the speed of the target vehicle;
detecting a deceleration of the target vehicle
evaluating a target vehicle stop distance between the target vehicle and the pedestrian crossing based on the target vehicle speed if the target vehicle has been detected in a deceleration mode;
comparing the evaluated target vehicle stop distance with a predetermined target stop distance threshold;
estimating a risk for the host vehicle of overtaking the target vehicle on the pedestrian crossing based on the comparison step result of the target vehicle stop distance .

[0007] The step of detecting a target vehicle may be a step of detecting the target vehicle traveling on an immediate adjacent lane of the host vehicle lane. The step of detecting the speed of the target vehicle may comprise a step of detecting a deceleration motion of the target vehicle; and wherein the step of evaluating the target vehicle stop distance may be a step of estimating the target vehicle stop distance between the target vehicle and the pedestrian crossing by considering a linear deceleration of the target vehicle.

[0008] The method may further comprises the steps of determining the speed of the host vehicle; evaluating a host vehicle stop distance between the host vehicle and the pedestrian crossing based on the host vehicle speed; comparing the estimated host vehicle stop distance with a predetermined pedestrian crossing stop distance threshold; and adjusting the estimated risk according to comparison step of the estimated host vehicle stop distance. More particularly, the step of evaluation a host vehicle stop distance may comprise a step of estimating the speed of the host vehicle 10 at the pedestrian crossing point if a maximum force is applied on the brake system of the host vehicle 10.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Other features, objects and advantages of the invention will become apparent from reading the detailed description that follows, and the attached drawings, given by way of example and in which:

- Figure 1 is a traffic situation on a straight road wherein a host vehicle intends to overtake a target vehicle on a pedestrian crossing;
- Figure 2 is a traffic situation on a curved road wherein the host vehicle intends to overtake the target vehicle

- on a pedestrian crossing;
- Figure 3 is an illustration of a risk evaluation system for a host vehicle for assessing the risk of overtaking a target vehicle on a pedestrian crossing embedded in the host vehicle in accordance with one embodiment;
- Figure 4 is flow chart of a method for the host vehicle to assess risk of overtaking a target vehicle on a pedestrian crossing in accordance with one embodiment;
- Figure 5 is a graph illustrating a sequence of the host vehicle during an overtaking manoeuvre of the target vehicle, said host vehicle comprising the risk evaluation system of figure 3 in accordance with one embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0010] Figure 1 and figure 2 are two non-limited examples of usual traffic situations wherein a host vehicle 10 and a target vehicle 12 drive toward a pedestrian crossing 14 and wherein a pedestrian 16 can potentially cross a road 18 on the pedestrian crossing 14. The target vehicle 12 and the host vehicle 10 are on two distinct traffic lanes 20, 22. Figure 2 differs from figure 1 only by the road shape, more particularly figure 1 is a situation wherein the road 18 is a straight road 18 and figure 2 is another particularly situation wherein the road 18 is a curved road 18. According to figure 1 and figure 2, the target vehicle 12 is closer to the pedestrian crossing 14 than the host vehicle 10 and the host vehicle 10 is not able to detect the potential presence of the pedestrian 16, said pedestrian 16, if any, being outside the front field of view 24 of the host vehicle 10. More particularly, a portion 26 of the front field of view 24 of the host vehicle 10 is occluded by the target vehicle 12 such that the pedestrian 16 cannot be detected by the host vehicle 10. In other words, if a pedestrian 16 is located at the portion 28 of the pedestrian crossing 14 occluded by the target vehicle 12 for the host vehicle 10, the pedestrian 16 won't be visible by a driver of the host vehicle 10 or by any front camera, front or side radar, or lidar of the host vehicle 10.

[0011] In order to assess the risk of overtaking the target vehicle 12 on the pedestrian crossing 14, according to figure 3, the host vehicle 10 comprises object detector means 30 for detecting pedestrians 16 crossing and target vehicles 12. The object detector means 30 are arranged on the host vehicle 10 such that they are configured to detect object in the front of the vehicle 10, said object detector means 30 having a front field of view 24 covering the front direction 29 of the host vehicle 10.

[0012] More particularly, the object detector means 30 comprises road sign detector 32 configured to detect marks on the road 18 as pedestrian crossing 14 and/or pedestrian traffic sign. As non-limited example, road sign detector 32 may be a camera 34, a vehicle to infrastructure communication device 36, or a global positioning

system (GPS) 38, more particularly, the maps information of the GPS. Combination of such road sign detectors 32 is also a possibility in order to get the most reliable presence information on the detected pedestrian crossing 14.

[0013] In addition, the object detector means 30 comprises vehicle detector 40 configured to detect the target vehicle 12. As non-limiting example, the vehicle detector 40 may be a camera 42, a radar 44, or a lidar 46. Combination of such vehicle detectors 40 is also a possibility in order to get the most reliable dynamic information on the detected target vehicle 12. The host vehicle 10 may have a unique front camera 34, 42 for target vehicle 12 detection and for pedestrian crossing 14 detection.

[0014] The host vehicle 10 further comprises a controller 48 configured to analyze the detected objects. More particularly, the controller 48 is configured to analyze 50 the detected pedestrian crossing 14 as the location 52 of said pedestrian crossing 14.

[0015] The controller 48 is further configured to analyze the driving behavior 54 of the detected target vehicle 12. As non-limiting example, the analysis of the driving behavior 54 of the target vehicle 12 comprises determination of parameters of the target vehicle 12 as location 56, speed 58, and direction 29. Speed 58 estimation of the target vehicle 12 may also comprise estimation of the yaw rate of the target vehicle 12, acceleration of the target vehicle 12 and deceleration of the target vehicle 12. Estimation of the location 56 of the target vehicle 12 may also comprise the estimation of the lane 22 of the road 18 on which the target vehicle 10 is driving.

[0016] The controller 48 is also further configured to analyze the driving behavior 54 of the host vehicle 10 as being in communication with other sensors of (not shown) the host vehicle 10. As non-limiting example, the analysis of the driving behavior 54 of the host vehicle 10 comprises determination of parameters of the host vehicle 10 as location, speed, and direction. Speed estimation of the host vehicle 10 may also comprise estimation of the yaw rate of the host vehicle 10, acceleration of the host vehicle 10 and deceleration of the host vehicle 10. Estimation of the location of the host vehicle may also comprise the estimation of the lane 20 of the road 18 on which the host vehicle 10 is driving.

[0017] According to the pedestrian crossing analysis 50 and according to the target vehicle 12 and to the host vehicle 10 driving behavior analysis 54, the controller 48 is configured to determine a target vehicle 12 to host vehicle 10 relative longitudinal position according to a host curvilinear coordinate system and also a target vehicle 12 to a host vehicle 10 relative lateral position 31.

[0018] The controller 48 is also further configured to determine a longitudinal distance according to the curvilinear coordinate system between the host vehicle 10 and the pedestrian crossing 14 and between the target vehicle 12 and the pedestrian crossing 14.

[0019] In addition, the controller 48 is configured to determine the road shape according to the determination

of the motion of the host vehicle 10 and of the motion of the target vehicle 12, said motion of both vehicles 10, 12 being based on a regular determination of the position of both vehicles 10, 12. The road shape determination may be more accurately determined, if possible, by using information from the maps of global positioning system 38 of the host vehicle 10.

[0020] According to the determined parameters and estimated parameters of both target 12 and host 10 vehicle, the controller 48 is configured to assess 60 the risk of overtaking the target vehicle 12 on the pedestrian crossing 14. The risk is binary coded 62, as for instance coded as a '0' if no risks are estimated and as a '1' if a risk is estimated.

[0021] A no risks situation may be a situation wherein the host vehicle 10 determines that the target vehicle 12 stops before reaching the pedestrian crossing 14 at a sufficient distance from the pedestrian crossing 14, such that, the host vehicle 10 overtaking the target vehicle 12 and still driving towards the pedestrian crossing 14, will be able to detect the previously occluded portion 28 of the pedestrian crossing 14 enough in advance to check if there is a presence of a pedestrian 16 on the pedestrian crossing 14, and such that the host vehicle 10 will be able to avoid collision with the pedestrian 16, if any, by braking or changing lane 20, 22.

[0022] A risk situation may be a situation wherein the target vehicle 12 is occluding the field of view 24 of the host vehicle 10 while the host vehicle 10 is overtaking the target vehicle 12 such that pedestrian 16 on the pedestrian crossing 14 cannot be detected by the host vehicle 10.

[0023] The binary coding 62 may also present more levels, as for instance a code '00' for no risks, '01' for low risk, '10' for medium risk, an '11' for severe risk. The granularity of the risk may be attached to the driving behavior 54 of the target vehicle 12 and of the host vehicle 10.

[0024] As no limited example, no risk estimation may be the situation previously described.

[0025] The low risk estimation may be a situation wherein the risk evaluation system of the host vehicle 10 determines that the speed 58 of the host vehicle 10 and the speed of the target vehicle 12 are slow enough such that collision with the pedestrian 16 may be avoided by a last moment braking action.

[0026] A medium risk estimation may be a situation wherein the host vehicle 10 detects an emergency braking of the target vehicle 12 such that the target vehicle 12 will stop at the limit of the pedestrian crossing 14. Said target vehicle 12 behavior detected by the host vehicle 10 is such that the host vehicle 10 considers a very high probability of the presence of the pedestrian 16 on the pedestrian crossing 14. Said situation may be estimated as a 'medium risk' as long as the risk estimation system estimates that the host vehicle 10 may still have possibility to stop just before reaching the pedestrian crossing 14, or changing lane 20, 22 to avoid potential collision

with the pedestrian 16.

[0027] A high risk estimation may be a situation wherein the target vehicle 12 behavior is similar as the medium risk but wherein the speed of the host vehicle 10 and the distance between the host vehicle 10 and the pedestrian crossing 14 is such that the risk estimation system estimates that there is no possible usual maneuvers (changing lane, braking) to avoid passing over the pedestrian crossing during the overtaking maneuver of the target vehicle 12. In said situation, in case of pedestrian 16 presence, such collision will only depend on the pedestrian 16 behavior.

[0028] When the risk estimation is not a no risks situation, the controller 48 may be also configured to estimate a potential location of the pedestrian 16 on the pedestrian crossing 14 when host vehicle 10 will arrive at the pedestrian crossing 14, such that the controller 48 may be configured to control 64 the host vehicle 10 to avoid the collision by bypassing the pedestrian 16.

[0029] Based on the risk estimation of a collision with a pedestrian 16 on the pedestrian crossing 14, the controller 48 is configured to directly control 64 the host vehicle 10 or may alert the driver of the host vehicle 10 on the best driving behavior to limit said potential collision. In other words, the controller 48 is configured to operate 74 the host vehicle 10 in automated mode 76 wherein driver does not control the host vehicle 10, or to operate 74 the vehicle in manual mode 78 wherein driver has still control on the host vehicle 10. The controller 48 may be configured such that the risk estimation system is adapted for manual vehicle and for an automated vehicle or driverless vehicle.

[0030] Based on the risk estimation of a collision with the pedestrian 16 on the pedestrian crossing 14, the controller 48 is configured to advice driver or to have control 64 on the host vehicle 10 in order to stop 66 the host vehicle 10, to adjust 68 the speed of the host vehicle 10 and/or to adjust the direction 70 of the host vehicle 10. Additionally the controller 40 is configured to get control on the activation of warning devices 72 as horn, or exterior light of the host vehicle 10 to get the attention of the potential pedestrian 16. In order to get control on the host vehicle 10, as for vehicle comprising advanced driver assistance systems (ADAS) or for automated vehicle, the controller 48 is thus configured to operate the vehicle controls 80 such as the brakes 82 of the host vehicle 10, the accelerator 84, the steering 86 of the host vehicle 10, and the warning devices such as the exterior lights 88 or the horn 90.

[0031] According to figure 4, a non-limited example of a method 100 for the host vehicle 10 to assess risk of overtaking the target vehicle 12 on the pedestrian crossing 14 is shown. The method 100 comprises a step of detecting 110 the presence of the pedestrian crossing 14 in the front field of view 24 of the host vehicle 10, i.e. on the host vehicle 10 path. Another step comprises the analysis of the driving behavior 170 of the target vehicle 12. More particularly, this step 170 consists at first on

determining regularly, i.e. monitoring, 120 the speed of the target vehicle 12 and detecting 130 if the target vehicle 12 is in deceleration mode. If the target vehicle 12 is not in a deceleration mode, the probability of the presence of the pedestrian 16 is considered as null. If the target vehicle 12 is in deceleration mode, a further step 140 consists on that the controller 48 of the host vehicle 10 predicts a null speed location of the target vehicle 12. Then a further step 150 consists on the analysis of the null speed location of the target vehicle 12. If the null speed location of the target vehicle 12 is at the pedestrian crossing 14 or at a very near distance from the pedestrian crossing 14 before passing on the pedestrian crossing 14, i.e. for instance 1 meter, then another step 160 of the method 100 consists of on considering a high probability of the presence of the pedestrian 16 engaged or engaging on the pedestrian crossing 14 such that a high risk of overtaking the target vehicle 12 on the pedestrian crossing 14 is estimated.

[0032] In other words, the controller 48 of the host vehicle 10 consider a high probability of the presence of the pedestrian 16 engaged or engaging on the pedestrian crossing 14 if the predicted target vehicle stop distance SD_t of the target vehicle 12, i.e. the distance between the location of the target vehicle 12 at a null speed and the location of the pedestrian crossing 14, is at a distance from the pedestrian crossing 14 lower than a predetermined target stop distance threshold TSD_{th}. The predetermined target stop distance threshold TSD_{th} is a distance from the pedestrian crossing 14 wherein the controller 48 could estimate that if the target vehicle 12 stops before said target stop distance threshold TSD_{th}, the reason of the stop of the target vehicle 12 is not the presence of a pedestrian 16 and that if the target vehicle 12 stops between said target stop distance threshold TSD_{th} and the pedestrian crossing 14, the reason of the stop of the target vehicle 12 is the presence of a pedestrian 16.

[0033] More generally, when the host vehicle 10 considers a high probability of the presence of a pedestrian 16 engaged or engaging on a pedestrian crossing 14, the host vehicle 10 may estimate a high risk of overtaking the target vehicle 12 on the pedestrian crossing 14.

[0034] Other parameters may be also evaluated to refine the method 100 for the host vehicle 10 to assess risk of overtaking the target vehicle 12 on the pedestrian crossing 14. More particularly, the driving behavior of the host vehicle 10 may also be considered. Therefor the method 100 may comprises a step of determining the speed of the host vehicle 10 such that an evaluation of the distance, called the host vehicle stop distance SD_h, between the host vehicle 10 and the pedestrian crossing 14 may be performed by the controller 48. Said host vehicle stop distance SD_h may be evaluated according to a maximum braking force of the host vehicle, i.e. in an emergency braking mode of the host vehicle 10. Then a step of comparing the estimated stop distance SD_h of the host vehicle 10 with a predetermined safe distance

from the pedestrian crossing at which the controller 48 considers that there is no risks of collision with a pedestrian 16 on the pedestrian crossing 14 is performed. Said safe distance may be used as a threshold level for the comparison step, said threshold level being called a predetermined pedestrian crossing stop distance threshold PCSD_{th}.

[0035] Thus, when the controller 48 of the host vehicle 10 estimates that the host vehicle 10 stop distance could be greater than the predetermined pedestrian crossing stop distance threshold, it means that the host vehicle 10 is able to stop before reaching the pedestrian crossing 14, thus, the risk of overtaking the target vehicle 12 such that host vehicle 10 may be able to stop before potential collision with the pedestrian 16 may be considered as a no risks situation.

[0036] According to figure 5, the target vehicle 12 driving behavior is represented by the first curve C1, while the host vehicle 10 driving behavior is represented by the second curve C2. The situation is comparable as the situation of figure 1 or figure 2. As the goal of the host vehicle 10 is to overtake the target vehicle 12, the position of the target vehicle 12 is closer to the pedestrian crossing 14 than the position of the host vehicle 10.

[0037] The V axis of the graph represents the speed of the target vehicle 12 and of the host vehicle 10. The X axis represents the location of the target vehicle 12 and of the host vehicle 10. Location and speed of both vehicles are represented over the time (T0, T1, T2, T3). The locations X0_h, X1_h, X2_h and X3_h correspond to the location of the host vehicle 10 respectively at the point of times T0, T1, T2 and T3. The locations X0_t, X1_t, X2_t and X3_t correspond to the location of the target vehicle 12 respectively at the point of times T0, T1, T2 and T3.

[0038] The graph is split in three phases P1, P2, P3.

[0039] First phase P1 is the phase wherein the speed of both vehicles 10, 12 is constant. More particularly, the speed of the host vehicle 10 is higher than the speed of the target vehicle 12 such that the host vehicle 10 is closer to the target vehicle 12 at the point of time T1 than at point of time T0. During said first phase, even so the host vehicle detects the pedestrian crossing 14, the controller 48 of the host vehicle 10 considers a no risks situation as the speed of the target vehicle 12 is constant.

[0040] The controller may also adjust the risk estimation by comparing the speed of the target vehicle 12 with a predetermined minimum speed of the target vehicle threshold MST_{th} such that, as represented by the graph, risk is considered as a no risks situation when the speed of the target vehicle 12 is detected as greater than said predetermined minimum speed of the target vehicle threshold MST_{th}. A determined speed of the target vehicle greater than the predetermined minimum speed of the target vehicle threshold MST_{th} is interpreted as a driving behavior of the target vehicle 12 such that target vehicle does not detect any pedestrians in its front field of view.

[0041] On the other hand, when the speed of the target 12 is lower than the predetermined minimum speed of the target vehicle threshold MST_{th}, then it would be considered by the controller 48 of the host vehicle 10 as a potential risk of the presence of a pedestrian 16 on the pedestrian crossing 14. A determined speed of the target vehicle lower than the predetermined minimum speed of the target vehicle threshold MST_{th} is interpreted as a driving behavior of the target vehicle 12 such that target vehicle 12 does detect a pedestrians in its front field of view.

[0042] The second phase P2 is the phase wherein the target vehicle 12 is in deceleration mode and wherein the host vehicle 10 is still at a constant speed. During said second phase P2, in addition to the detection of the pedestrian crossing 14, the host vehicle 10 detects the deceleration of the target vehicle 12 such that a no risks situation may be reconsidered by the controller 48 of the host vehicle 10. One possibility is that the controller 48 of the host vehicle 10 estimates the potential target vehicle stop distance SD_t, by considering a linear deceleration of the target vehicle 12. Then, the controller 48 may estimate that there is a risk of a potential presence of a pedestrian 16 on the occluded portion 28 of the pedestrian crossing 14 if the predicted target vehicle stop distance SD_t is at a distance lower to the pedestrian crossing 14 than the predetermined target stop distance threshold TSD_{th}.

[0043] From figure 5, it has to be considered that the predicted target vehicle stop distance SD_t is at a distance from the pedestrian crossing 14 lower than the predetermined target stop distance threshold TSD_{th} such that the controller 48 estimates that there is a presence of a pedestrian 16 on the occluded portion 28 of the pedestrian crossing 14.

[0044] However, as illustrated at the point of time T2, the host vehicle 10 still runs at the constant speed as long as the controller 48 estimates that a braking action BA of the host vehicle 10, especially a maximum braking force, is enough to stop the host vehicle 10 at a distance SD_h greater than the predetermined pedestrian crossing stop distance threshold PCSD_{th}. Thus, during such second phase P2, the manoeuver of overtaking the target vehicle 12 is a no risks situation.

[0045] The third phase P3 starts at the point of time T3 wherein the risk of overtaking the target vehicle 12 is considered as not being any more a no risks situation. More particularly, the third phase P3 starts when the controller 48 of the host vehicle 10 estimates that by applying a maximum force on the braking system of the host vehicle 10, i.e. operating an emergency brake, the host vehicle 10 will stop at a distance SD_h equal or lower than the predetermined pedestrian crossing stop distance threshold PCSD_{th}. In said situation, controller 48 takes control on the host vehicle 10 such that emergency braking is activated.

Claims

1. A risk evaluation system for a host vehicle (10) for assessing the risk of overtaking a target vehicle (12) on a pedestrian crossing (14) comprising,
 - object detector means (30) configured to detect a pedestrian crossing (14) and to detect a target vehicle (12) in the front field of view of the host vehicle (10);
 - a controller (48) in communication with the object detector means (30), wherein the controller is configured to determine the pedestrian crossing location (50) and to determine the target vehicle driving behavior (54);
 - characterized in that** the controller (48) is further configured to detect a deceleration of the target vehicle (12)
 - evaluate a target vehicle stop distance (SD_t) between the target vehicle (12) and the pedestrian crossing (14) based on the target vehicle speed if the target vehicle (12) has been detected in a deceleration mode;
 - compare the evaluated target vehicle stop distance (SD_t) with a predetermined target stop distance threshold (TSD_{th});
 - estimate a risk for the host vehicle (10) of overtaking the target vehicle (12) on the pedestrian crossing (14) based on the comparison step result of the target vehicle stop distance (SD_t).
2. Method (100) for a host vehicle (10) to assess risk of overtaking a target vehicle (12) on a pedestrian crossing (14) comprising the steps of
 - detecting (110) a pedestrian crossing (14) on the host vehicle (10) path;
 - detecting a target vehicle (12) traveling toward the pedestrian crossing (14);
 - determining (120) the speed of the target vehicle;
 - detecting (130) a deceleration of the target vehicle
 - evaluating (140) a target vehicle stop distance (SD_t) between the target vehicle (12) and the pedestrian crossing (14) based on the target vehicle speed if the target vehicle (12) has been detected in a deceleration mode;
 - comparing (150) the evaluated target vehicle stop distance (SD_t) with a predetermined target stop distance threshold (TSD_{th});
 - estimating (160) a risk for the host vehicle (10) of overtaking the target vehicle (12) on the pedestrian crossing (14) based on the comparison step result of the target vehicle stop distance (SD_t).
3. Method (100) according to claim 2 wherein the step of detecting a target vehicle (12) is a step of detecting the target vehicle (12) traveling on an immediate adjacent lane (22) of the host vehicle lane (20).
4. Method (100) according to any one of the claims 2

or 3 wherein

the step of detecting (120) the speed of the target vehicle (12) comprises a step of detecting a deceleration motion of the target vehicle (12); and wherein the step of evaluating the target vehicle stop distance (SD_t) is a step of estimating the target vehicle stop distance (SD_t) between the target vehicle and the pedestrian crossing (14) by considering a linear deceleration of the target vehicle (12).

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5. Method (100) according to any one of the claims 2 to 4 further comprising the steps of:

determining the speed of the host vehicle (10);
evaluating a host vehicle stop distance (SD_h)
between the host vehicle (10) and the pedestrian crossing (14) based on the host vehicle speed;
comparing the estimated host vehicle stop distance (SD_h) with a predetermined pedestrian crossing stop distance threshold (PCSD_{th});
adjusting the estimated risk according to comparison step of the estimated host vehicle stop distance (SD_h).

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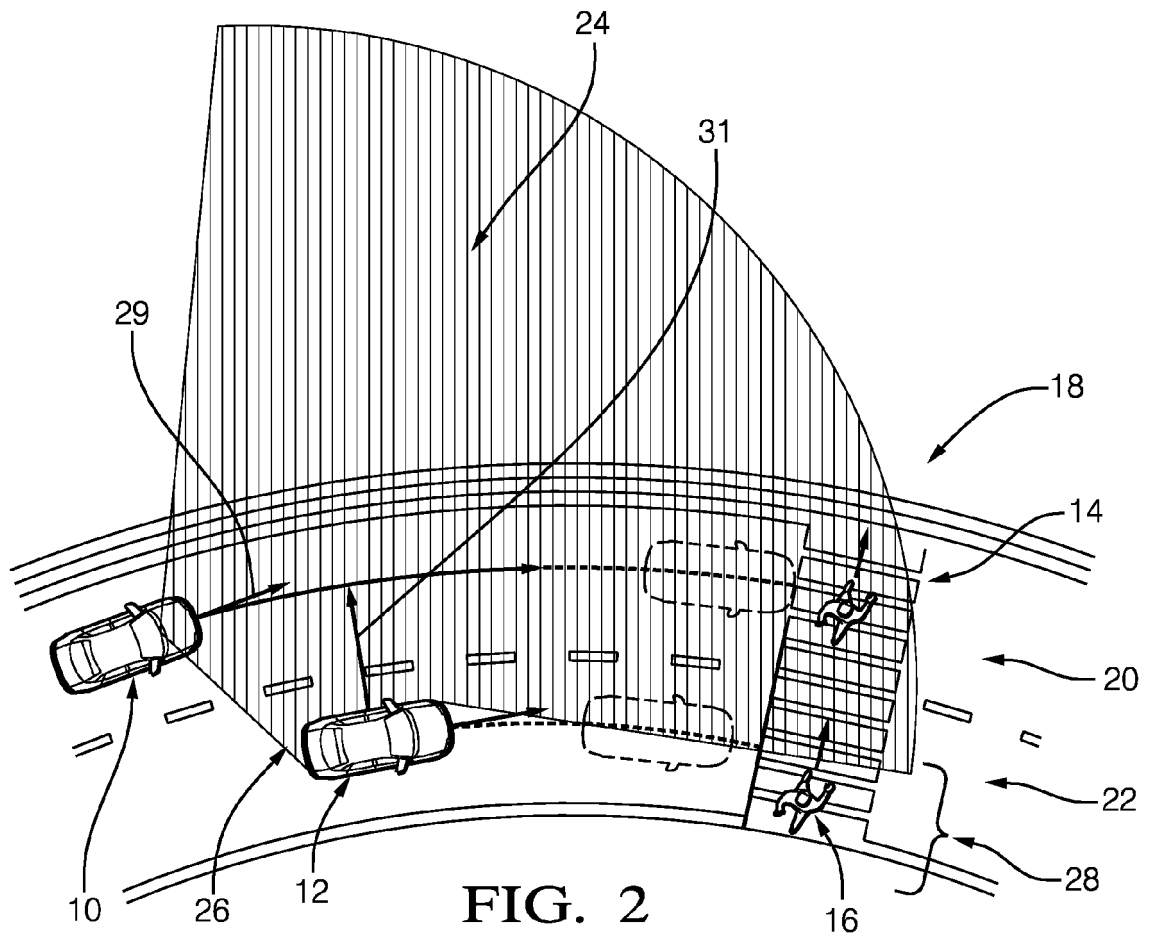
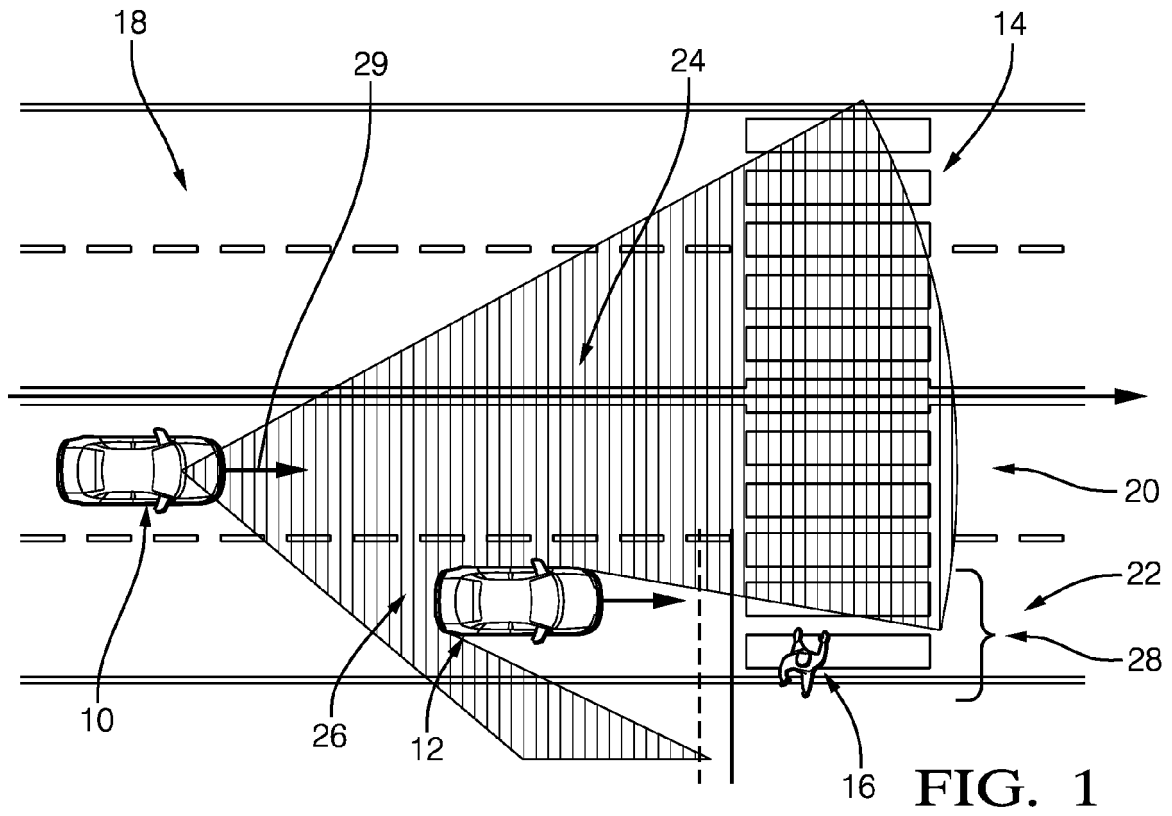
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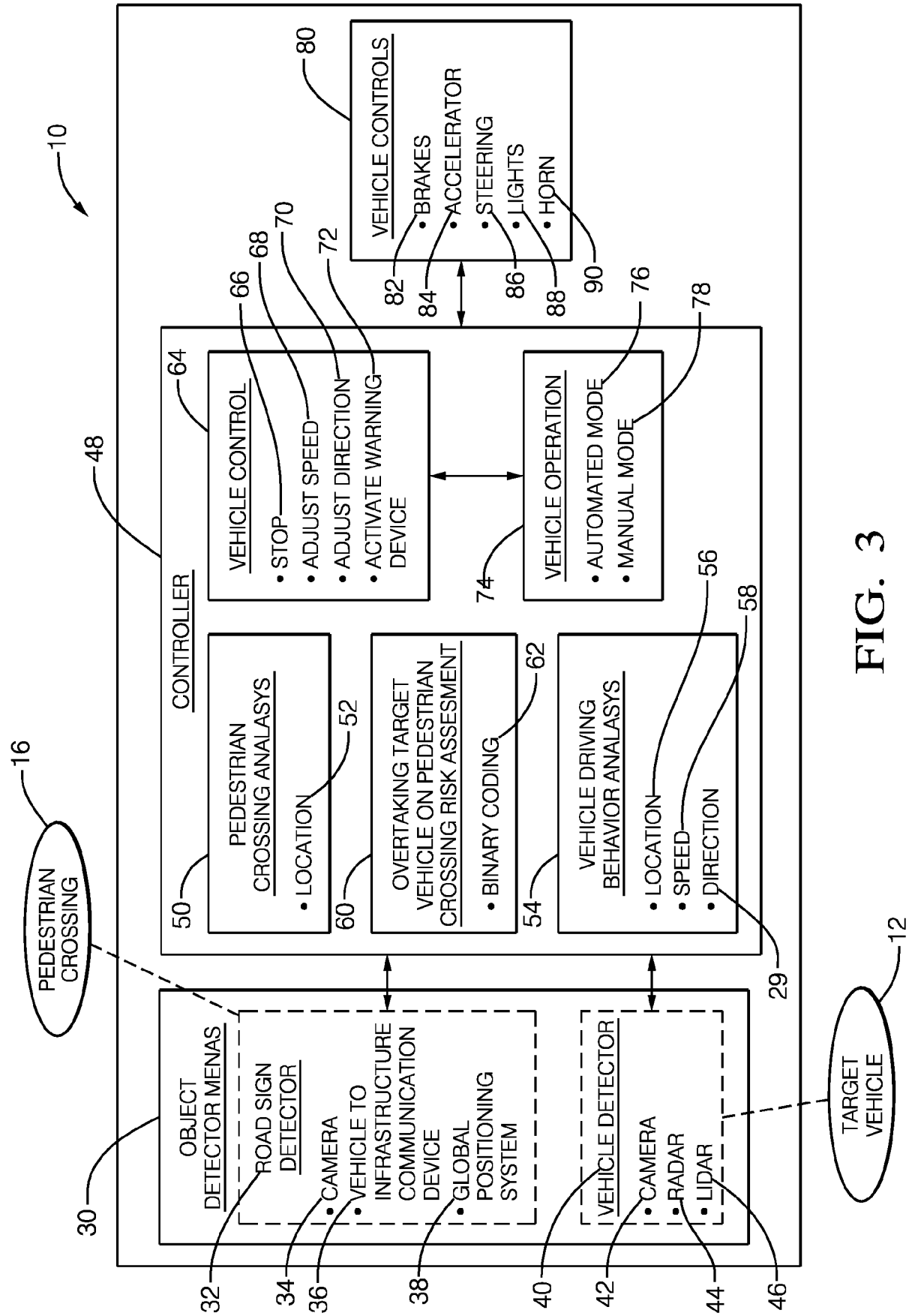


FIG. 3

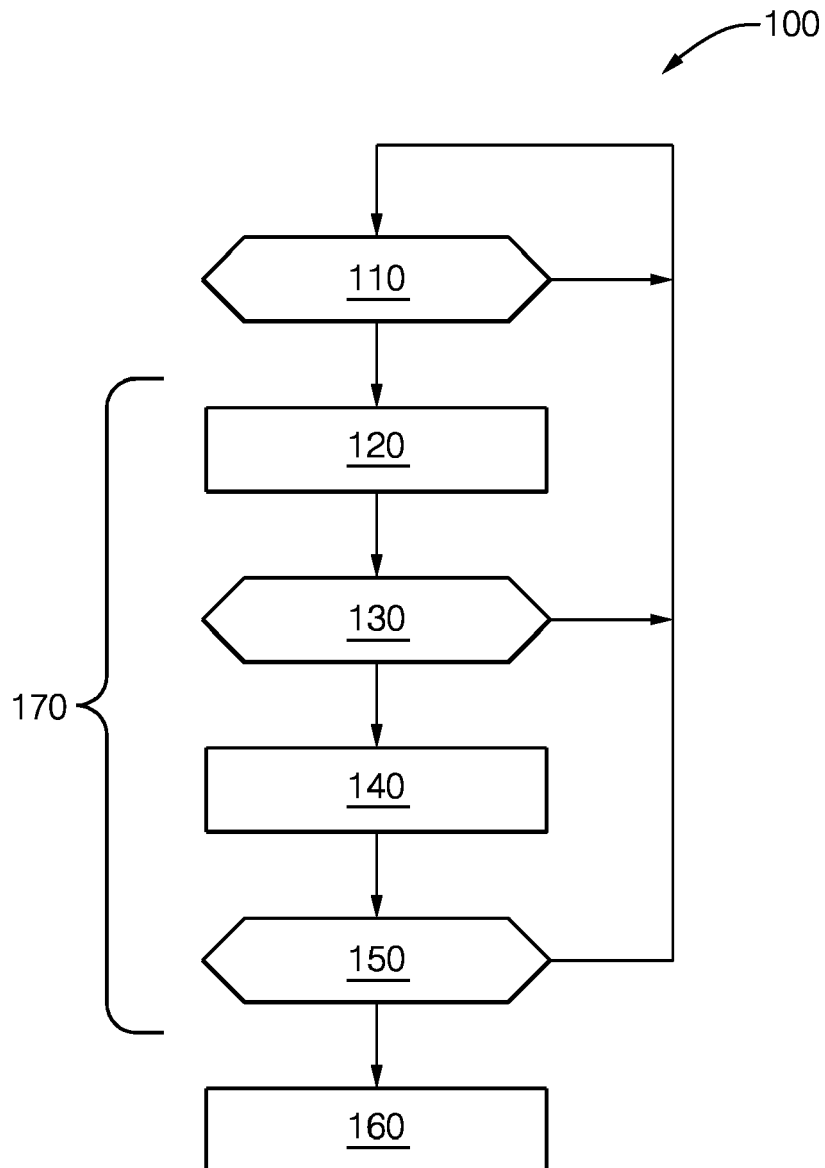
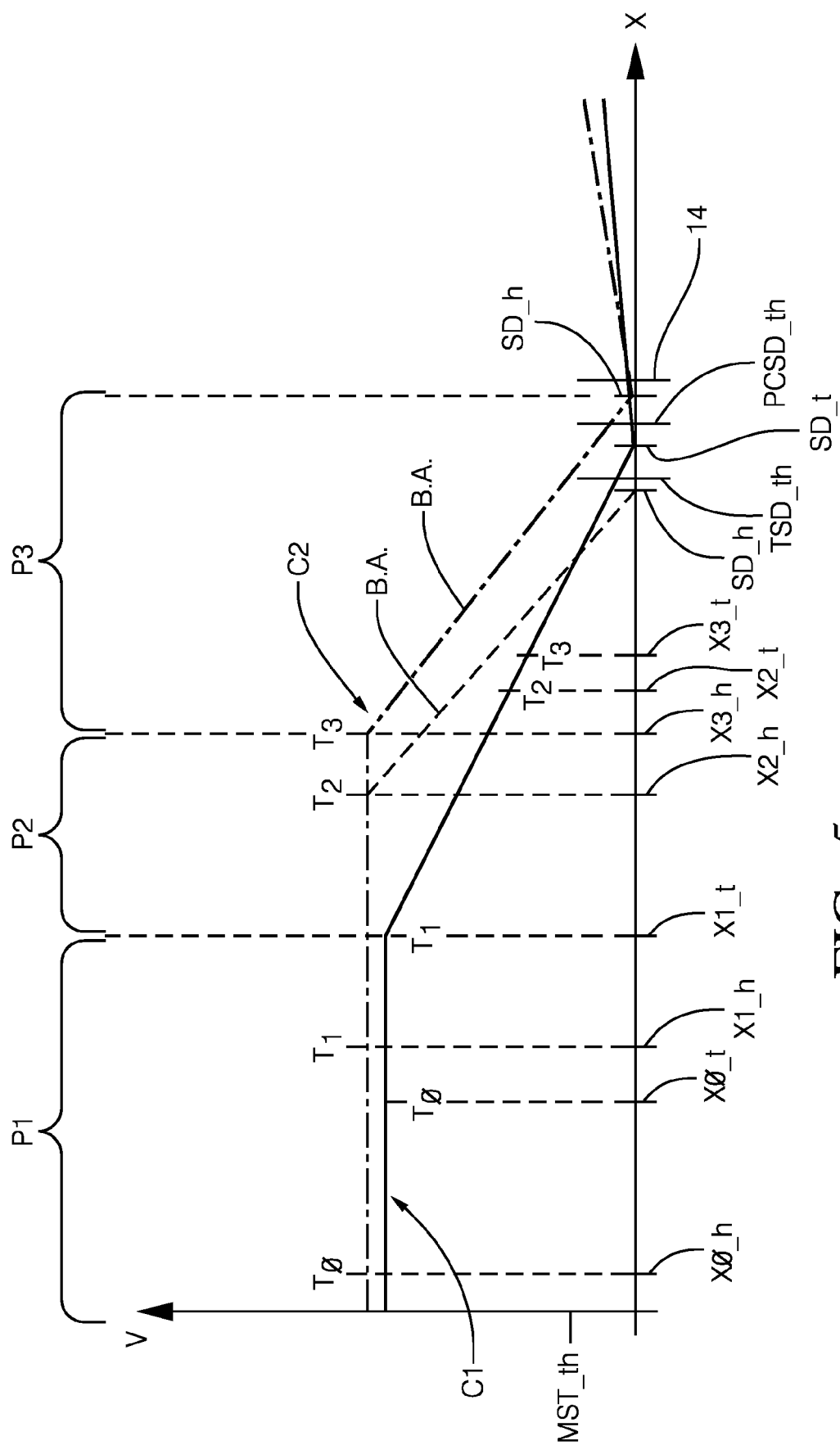


FIG. 4





EUROPEAN SEARCH REPORT

Application Number
EP 18 17 5202

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 3 273 423 A1 (CONTINENTAL AUTOMOTIVE GMBH [DE]) 24 January 2018 (2018-01-24) * abstract * * paragraphs [0001], [0006] - [0008], [0011], [0027] * * figure 3 * * claim 1 *	1-5	INV. G08G1/16
A	US 2009/303026 A1 (BROGGI ALBERTO [IT] ET AL) 10 December 2009 (2009-12-10) * abstract * * paragraph [0032] - paragraph [0037] * * figures 2A-2D *	1-5	
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 November 2018	Examiner Van den Bosch, I
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 17 5202

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82