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Intelligent Ground Vehicle and Automated Driving

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Abstract— This paper depicts the outline of an Automated Ground Vehicle which was created as the primary body for an Unmanned Ground Vehicle. The stringent prerequisite for rough terrain capacities and the need to consolidate a plenty of vision based sensing component was the fundamental outline criteria that were satisfied by the Automated Ground Vehicle. This vehicle is fused with a large group of actuators, instrumentation and drive circuits, Data Acquisition System and remote correspondence and control module. We also propose an arrangement of algorithms which prompt the arrangement of street and vehicle division utilizing information from a shading camera. The algorithms depicted here consolidate dim worth contrast and composition investigation procedures to portion the street from the picture, a few geometric changes.

Keywords— Automated Ground Vehicle, Lane Detection, Car Detection, Control Module, SPORV, UGV

I. INTRODUCTION

A self-sufficient ground vehicle is a vehicle that explores and drives completely all alone without a human driver. Through the utilization of different sensors and situating frameworks, the vehicle finds out about its surroundings and does the undertaking it has been allotted. The camera helped route is extremely critical in independent shrewd vehicle applications. A typical way to deal with tackle self-sufficient vehicle direction issues is to place a solitary cam mounted inside the auto, looking to the street ahead. Automated Ground Vehicles (AGV) are for the most part arranged into the versatile robot class with incredible promising potential later on. These Ground Vehicles are needed in military applications to minimize faculty in dangerous region and in the meantime to go about as the eyes and ears for the strategic unit. These vehicles can be utilized in different situations, including assessment and transfer of the unstable gadgets and other mule applications. To amplify their viability in these circumstances, the vehicles must explore jumbled situations in the vicinity of impediments, in a perfect world at fast.

II. ADVANTAGES

Fewer traffic collisions, due to an autonomous system's increased reliability and faster reaction time compared to human drivers. Removal of the constraints on occupants' state. In an autonomous car, it would not matter if the occupants were under age, over age, blind, distracted, intoxicated, or otherwise impaired. Elimination of redundant passengers – the robotic car could drive unoccupied to wherever it is required, such as to pick up passengers or to go in for maintenance.

III. FEATURES

The system control console can be accessed through and Wi-Fi enabled device. This facilitates a wide variety of compatible devices such as Laptops, Mobile Phones, Tablets, etc. The Web-App requires authentication in order to allow access to the control console. This prevents access to the console by unauthorized persons. The system is highly modular and well abstracted at all levels. This makes the system very easy to implement, maintain and upgrade. Since the various tasks are distributed among multiple modules, and the modules themselves are implemented on different computing elements, a lot of the work can be done simultaneously.

IV. LANE DETECTION ALGORITHM

Lane detection is a decently scrutinized zone of computer vision with applications in independent vehicles and driver bolster systems. Despite the apparent effortlessness of discovering white markings on a dull street, challenges land from shadows, impediment by different vehicles, changes in the street surfaces itself, and varying sorts of path markings. Then again, for our situation, having sectioned the street first issues us thoughts regarding where the paths can lie. Be that as it may, one needs to remember that if there is substantial movement it might be difficult to fragment the black-top consummately and path identification could at present represent an issue. For such cases a basic yet successful calculation has been proposed. The Lane detection algorithm consists of three stages – Canny Edge Detection, Contour Extraction and Hough Transform.

A. Lane Contour Detection

Canny Edge Detection is done on the image to extract the contours of the edges.
After canny edge detection, we make a 8-connected segment investigation and arrange the diverse districts as indicated by their shape lengths and incorporate just the ones that are sufficiently long to be a path. As of right now, the "path

applicants" are gotten. Since curves (for this situation, paths) can be considered as lines in little interims, a hearty line fitting is performed. The thought in robust fitting is to minimize a strong capacity of the residuals iteratively subject to the parameter vector i.e. minimize

$$\sum_{i=0}^{n} \rho\left[\ddot{y}_i - f(\bar{x}_i, \alpha)\right] \quad [1]$$

The following step is the Hough Transform. Hough Transform is the most regularly utilized system for the discovery of normal bends, for example, lines, circles, ovals, and so on. The thought for Hough Transform is in view of the way that bends produced by collinear focuses in the angle picture cross in tops (r,θ) in the Hough change space where the comparison for portraying an arrangement of lines is given by:

$$x\cos\theta + y\sin\theta = r \quad [2]$$

This equation indicates a line going through (x,y) that is opposite to the line attracted from the root to (r,θ) . By thresholding the subsequent picture in the Hough Transform space, the lines that go through corners or edges in the picture are found. Corners or edges ought to be considered as the top focuses where the majority of the lines go through.
Despite the fact that the paths have bended geometry, Hough Transform will in any case issue us a decent rough guess, approximating shape as an always showing signs of change arrangement of lines. This methodology brings about a decent rough guess of the path, without utilizing the black-top data.

B. Car Detection

New vehicle location and reconnaissance advances are always being created and existing innovations enhanced, to give rate observing, movement checking, vicinity discovery, progress estimation, vehicle order, and measure in-motion information. Since our primary interest lies in examining the movement at crossing points, the auto discovery calculation created has the presumption that the independent vehicle is very still and needs to comprehend the activity development around.
A development identification framework in view of Kalman Filters has been executed for distinguishing moving autos around. After the estimation of the development, the picture is differentiated into 8-connected segments and the areas that possess a predefined zone are chosen. These are delegated substantial moving items, speaking to the automatics, as a rule.

V. CONTROL MODULE OF SPORV

SPORV stands for Special Purpose Off Road Vehicle.

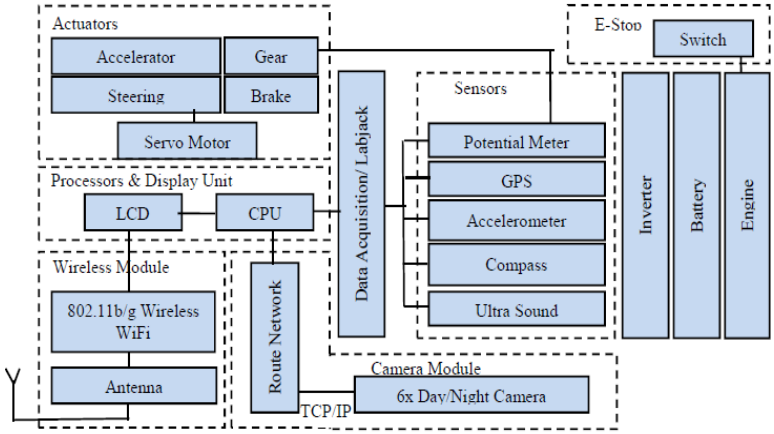

Fig.1 LANDARC's SPORV instrumentation and control sub-modules.

VI. REMOTE MODULE OF SPORV

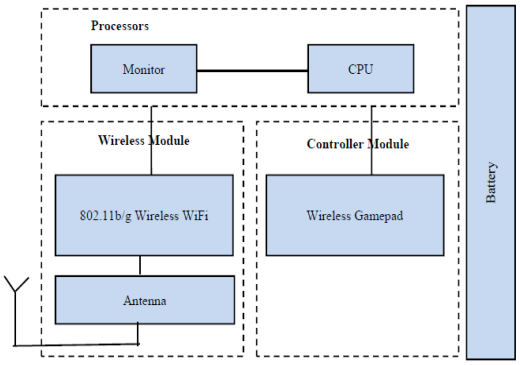

Fig. 2 Sub-modules of LANDARC's remote operator module

VII. PRELIMINARY RESULT

All mechanical and electro mechanical segments of the SPORV were effectively tried physically. The most vital segment of the framework, the safeguard crisis stop catches worked by set outline necessity. The catches can be utilized to end SPORV's operation in crisis circumstances.

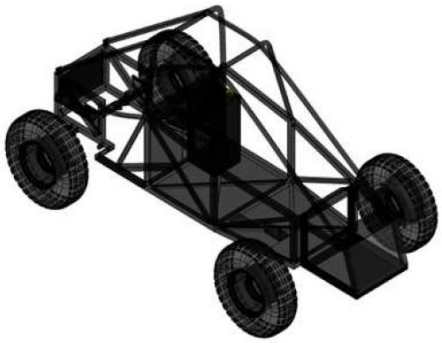

Fig.3 Conceptual Outline of SPORV

VIII. CONCLUSION

In this paper a system for self-sufficient vehicle vision applications is displayed as a premise for calculations that ought to go ahead top of this system. Composition worth likenesses have been consolidated to enhance the exactness of the examination. Future work will incorporate finding the crossing points and recognizing alternate vehicles introduce around the crossing point. Path following will be included request to utilize the data of the past casings for enhancing the precision of path identification. Sooner rather than later, this will be incorporated with the savvy control module and the investigation modules (biometric, picture handling and so on) to completely change the into an undeniable UGV.

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REFERENCES

[1] J.F. Canny, *A computational approach to edge detection*. IEEE Trans Pattern Analysis and Machine Intelligence, 8(6): 679-698, Nov 1986.

[2] Masoud Ghaffari, Souma M. Alhaj Ali, Vidyasagar Murthy, Xiaoqun Liao, Justin Gaylor and Ernest L. Hall, *Design of an Unmanned Ground Vehicle, Bearcat III, Theory and Practice*,Journal of Robotic Systems, Vol. 21 (2004), p. 471-480.

[3] Iagnemma, K., Udengaard, M., Ishigami, G., Spenko, M., Oncu, S., Khan, I., Overholt, J., and Hudas, G., *Design and Development of an Agile, Man Portable Unmanned Ground Vehicle*, 26th Army Science Conference (2008).

[4] Birdal, T. and Erçil, A. (2008) *Real-Time Automated Road, Lane and Car Detection for Autonomous Driving*. Sabanci University, Turkey.

[5] Arvin, F. Samsudin, K. and Nasseri, M. (2009) *Design of Differential-Drive Wheeled Robot Controller with Pulse-Width Modulation*. CITISIA, Malaysia.

[6] Suhaimi, A. and Saad, M. (2012) *Design of Special Purpose Off-Road Vehicle (SPORV) for Unmanned Ground Vehicle Application*. Trans Tech Publications, Switzerland.

[7] Chien, T.L.; Guo, H.; Su, K.L.; Shiau, S.V.; , Develop a Multiple Interface Based Fire Fighting Robot, *Mechatronics, ICM2007 4th IEEE International Conference on* , 8-10 May 2007, p.1-6

[8] Kim, Z. Realtime Lane Tracking of Curved Local Roads, *IEEE Intelligent Transportation Systems Conference*, pp. 1149-1155, 2006.

