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An Autonomous Aquatic Vehicle Routing Using Raspberry PI

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Abstract— Stereovision is 3D concept in which camera capturing the multiple images. Our purpose is to develop an autonomous system which should be able to monitor the obstacle, objects, buoys etc. and it will spark off the navigation system and intimate the base station about it. We put forword to develop a system using small size computer circuit (Raspberry PI). We propose a method of two frontal stereovision cameras (which are mounted on water navigation system) for Detection and avoidance of the object. This system monitors the object on routing path and calibrate the alternate route.[1] The final system should be capable of spot and following the destination path in a distance of over 5 meters.

Keywords— Raspberry PI, Raspberry PI Camera, GSM module, GPS module, DC motors

I. INTRODUCTION

Mainly automation is the most frequently spelled term in the field of electronics. The hunger for automation brought many revolutions in the existing technologies. Number of types of navigation techniques are present for different type of areas. Land navigation is very easer as compare to the margin navigation. Therefore need of water vehicle is important for marine obstacles. Generally, vehicles are being operated manually or by using image sensor which has been used by strong network monitoring just as GPS.[1]

Here we are using stereovision technique for navigation the monitor the obstacle and finalize the shortest path.

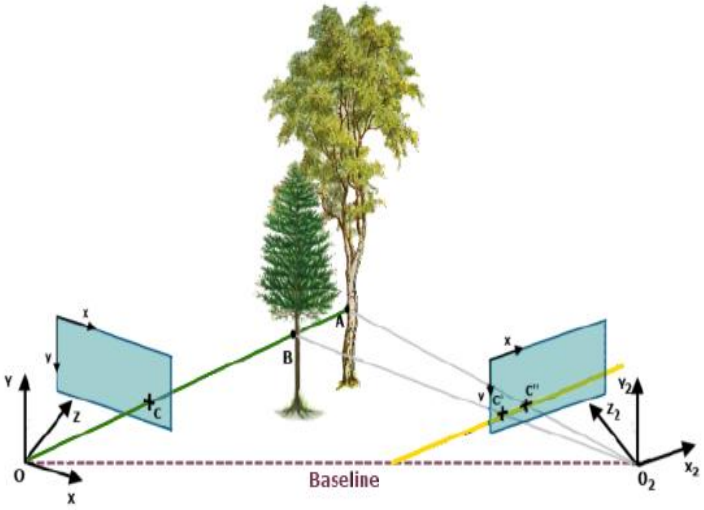


Fig. 1. Stereo Rig.

II. LITERATURE SURVEY

There are number of distance calculated techniques as per the technologies. LASER is the system which has also calculated distance, but it will not calculate long distance areas. Also, there are ultrasonic sensors for calculating distances which are based on sound. For the land or other indoor applications we used manually distance calculation technique. But for ocean, it is very difficult to calculate manually.[2][3]

There must be again one algorithm for distance calculation for aquatic surfaces and that is colour coding technique. We used for this buys and that buys are coloured. So from that we calculate distances.[4]

III. METHODOLOGY

1. System Architecture

This Block Diagram shows whole methodology.

- **Base Station Signalling :** Signalling is the process in which transferring one form of data to the another form. Generally signalling is used for sending information to the next station. Here we are using text massage sending to the autonomous system. System will continuously connected to the user by sending text massages.

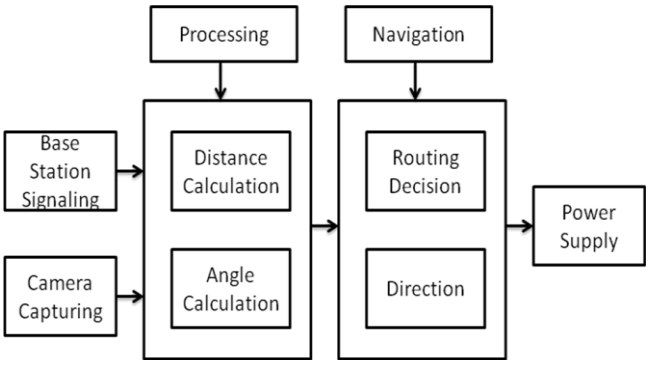


Fig. 2. System Block Diagram

- **Camera Capturing :** Raspberry PI camera is active while capturing images. There are number of aspects are present over the aquatic surface. So for that this camera will continuous capturing images and store in memory device which is present in Raspberry PI kit. Here only camera is for capturing the images and monitoring the aquatic objects.
- **Distance Calculation :** Distance is calculated through the latitude and longitude vales of particular area. User will fix the destination pint distance and through this, we calculate the final value.

DP*Latitude*Longitude#

- **Angle Calculation :** Also there is angle calculation algorithm. Through this, we calculate the particular angle if there is obstacle present in between the vehicle and destination point. As of system will calculate and covers the distance.
- **Processing :** Continuous sent text massage to the system by the user. This is the continuous process.
- **Navigation :** Navigation is the method which is used for indoor and outdoor purpose. Generally GPS technique is used for the outdoor navigation systems.
- **Routing Decisions :** Routing algorithm finalize the path follows the final destination.
- **Direction :** Through the required path system will calculate shortest path and follows this path and fix the direction also.
- **Power Supply :** System is having continuously DC power supply. A power supply may include a power distribution system as well as primary or secondary sources of energy.

2. System Flow Chart

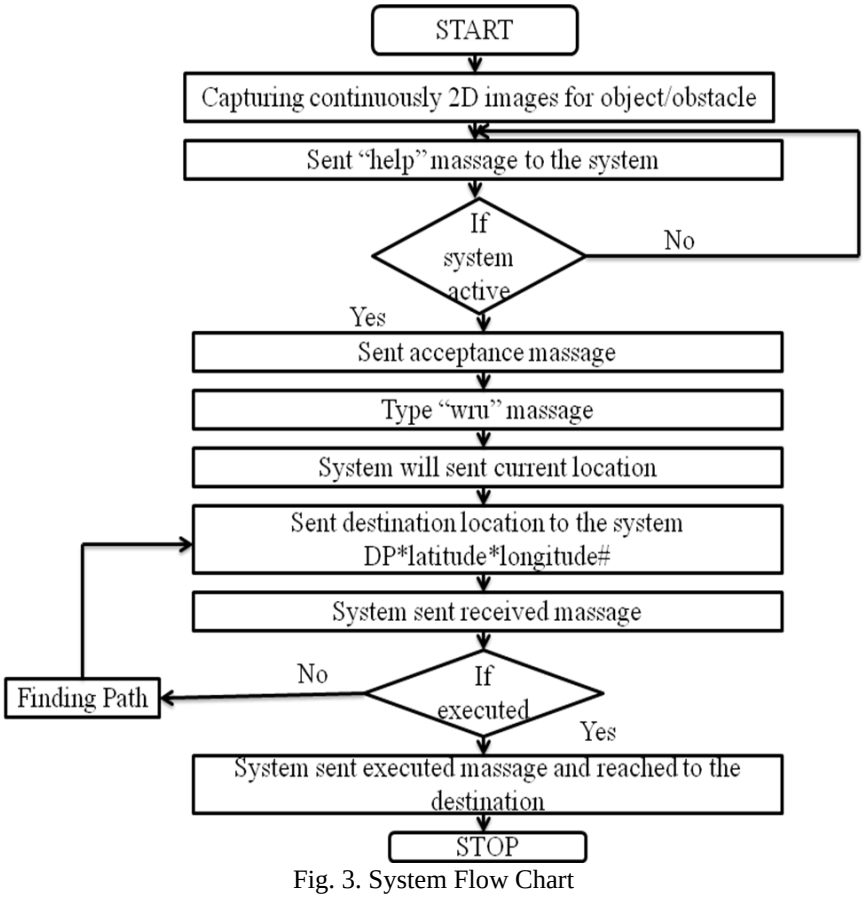


Fig. 3. System Flow Chart

Steps For Flow Chart

- START the system.
- Continuous capturing the images and store in the system memory card.
- Sent "help" massage to the system and activate the system. If system is fail to accept the massage then check the network and again sent the same massage to the system.
- Again ask to the system, where is the location at particular time by sending "wru" in small letter.
- For that system will sent its location in the form of there longitude and latitude value.
- Sent final value to the system means our destination value. From this system will calculate the distance and angle.

  Type: DP*Latitude*Longitude#
- Again system sent return massage to the user in the form of received comment.
- If system reaches to the destination then it will again sent executed massage to the system and if not then it will continuous searching the path.
- STOP the system.

3. Interfacing Diagram for system implementation

Here are schematic diagram and interfacing of PIC18F452 microcontroller with each module is considered**.**

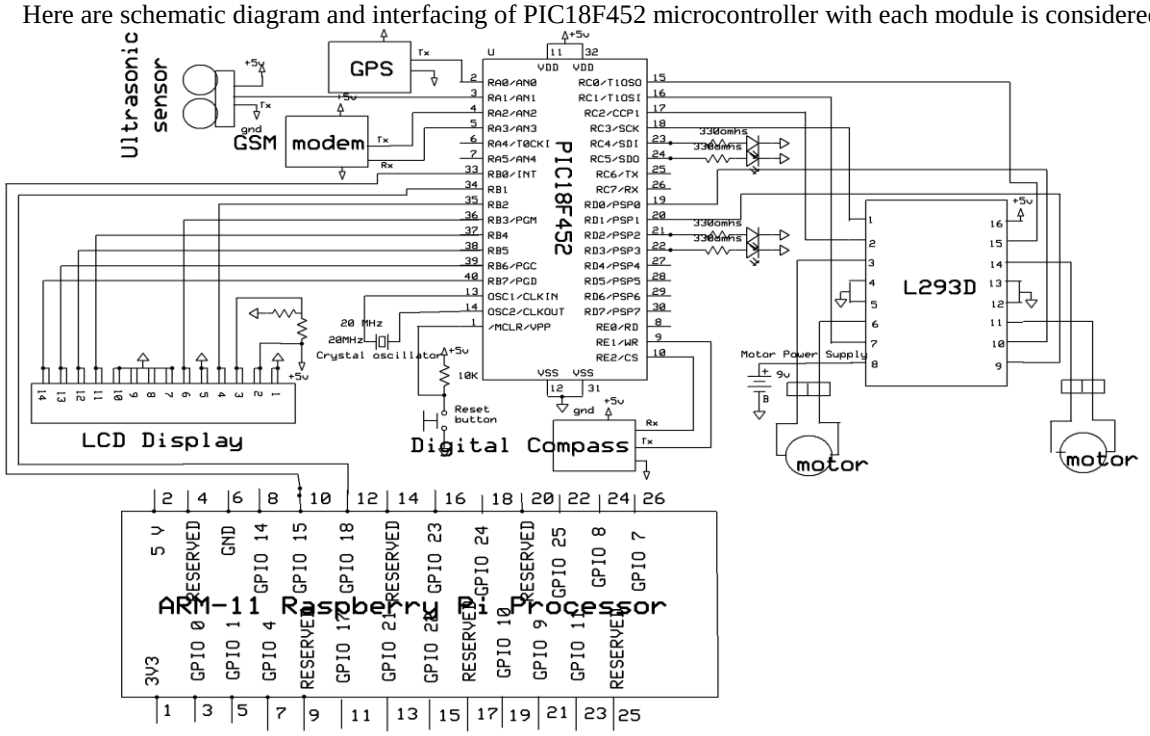


Fig 4. Schematic diagram

The above schematic diagram explains the interfacing section of each component with micro controller and GPS module for the location which is to be identified according to the user requirement. Crystal oscillator connected to 13th and 14th pins of micro controller and regulated power supply is also connected to micro controller and LED's also connected to micro controller through resistors.

IV. AUTONOMOUS VEHICLE ROUTING

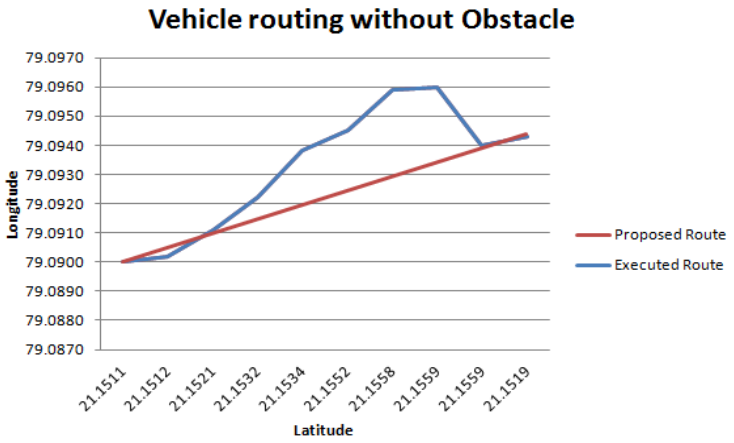
The project was designed for developing a navigation system, a navigable Boat using GPS, GSM and Digital compass. The boat moves according the GPS coordinates it receives from the user in the form of SMS. The boat also detects the obstacles using ultrasonic sensor and alerts the user about its location through SMS message.

Fig. 5. Model

V. RESULT & ANALYSIS

This part will outline the experimental setup and relevant results to authenticate the framework. There are with and without obstacle system flow models. This is the required result of the system.

Column1	Experimental System	Proposed System
Distance(m)	4.0100	14.0100
Time(min)	17.2100	10.0000
Speed(m/s)	23.3000	23.3000



There is without obstacle map for the system. Whole system is calculating distance, its time and speed by the x and y co-ordinates.

VI. CONCLUSION

Integrating features of all the hardware components used have been developed in it. Every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

Our project is mainly intended to design a navigation system, a navigable Boat using GPS, GSM and Digital compass. The controlling device of the whole system is a Microcontroller. The controller continuously reads data from GPS (Global Positioning System) receiver and displays this information on LCD display unit. The Microcontroller reads the predefined formatted SMS and extracts the GPS coordinates sent by user and moves the Boat in that direction with the help of GPS and Digital compass. The boat also uses ultrasonic sensor to detect obstacles in its way and when it finds obstacle it stops and sends the location to the user in the form of SMS messages.

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