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A MOBILE USERS IN INDOOR VISIBLE LIGHT COMMUNICATIONS USING ANGLE DIVERSITY RECEIVERS

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Abstract :

This problem has been solved mostly by using randomized algorithms, such as Probabilistic Road-Maps (PRM) Soil Sampling and path planning technique handles complex problems in high-dimensional spaces but usually operate in a binary world aiming to find out collision free solutions rather than the optimal path. Classical grid based methods can be used to compute resolution optimal paths over a cost map. To find paths quickly in large search spaces, roadmap based planners are ideal. Optimization of generated paths using randomized algorithms is addressed by that presents an iterative algorithm to optimize raw paths. Some of the methods extract optimized paths from motion planning roadmaps enabling collision detection and kinematic constraints. The road map is created by using reachability roadmap method which is particularly suited for motion planning in real time environments.

Key words – PRM, Soil sampling, optimal paths.

1. INTRODUCTION

The nutrients are classified in to two major classifications Micro and Macro nutrients. Micro nutrients are the nutrients which are essential for proper growth of the plant which are needed in only very small (micro) quantities. These elements are sometimes called minor elements or trace elements. The micronutrients are boron (B), copper (Cu), iron (Fe), chloride (Cl), manganese (Mn), molybdenum (Mo) and zinc (Zn). Recycling organic matter such as grass clippings and tree leaves is an excellent way of providing micronutrients (as well as macronutrients) to growing plants.

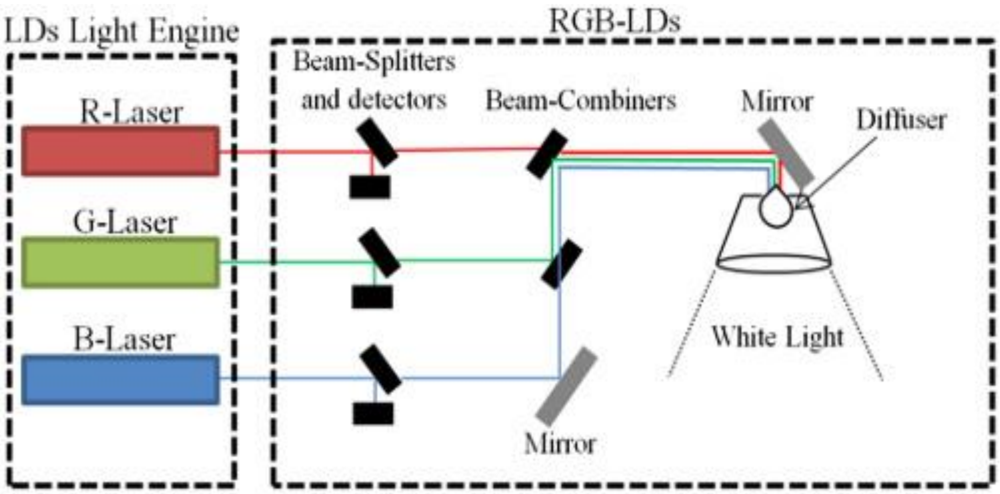

Fig.1. General structure of visible light communications

Macro nutrients are the nutrients that are abundantly available in the soil and that are required in larger quantities comparatively. Macronutrients can be broken into two more groups: primary and secondary nutrients. Primary nutrients are namely nitrogen (N), which exists in its oxide form phosphorus (P), and potassium (K) which exist in the soil mostly in their chloride and oxide form. These major nutrients usually are lacking from the soil first because plants use large amounts for their growth and survival. Secondary nutrients are calcium (Ca), magnesium (Mg), and sulfur (S). There are usually enough of these nutrients in the soil so fertilization is not always needed. Also, large amounts of Calcium and Magnesium are added when lime is applied to acidic soils. approach not only provides the efficient approach for collection and analysis. The Extended Kalman Filter is an unsupervised algorithm for tracking a robot in a continuous state space. The Kalman filter can recover the true stat of the object under noisy measurements. Common uses for the Kalman Filter are radar and sonar tracking and state estimation in robots. The advantages of Kalman Filter include no requirement of providing labeled training data and ability to handle noisy observations in exploration process, in this project it is required to excavate the regolith layer location in an open environment and perform studies on the constituents on the excavated samples.

2. PROPOSED SYSTEM

The methodology of this project starts with the design of the robot. The software design of the robot is done using the modeling software solid works version 2010. Since the software is user friendly, solid works is used. It is very simple to perform assembly options.

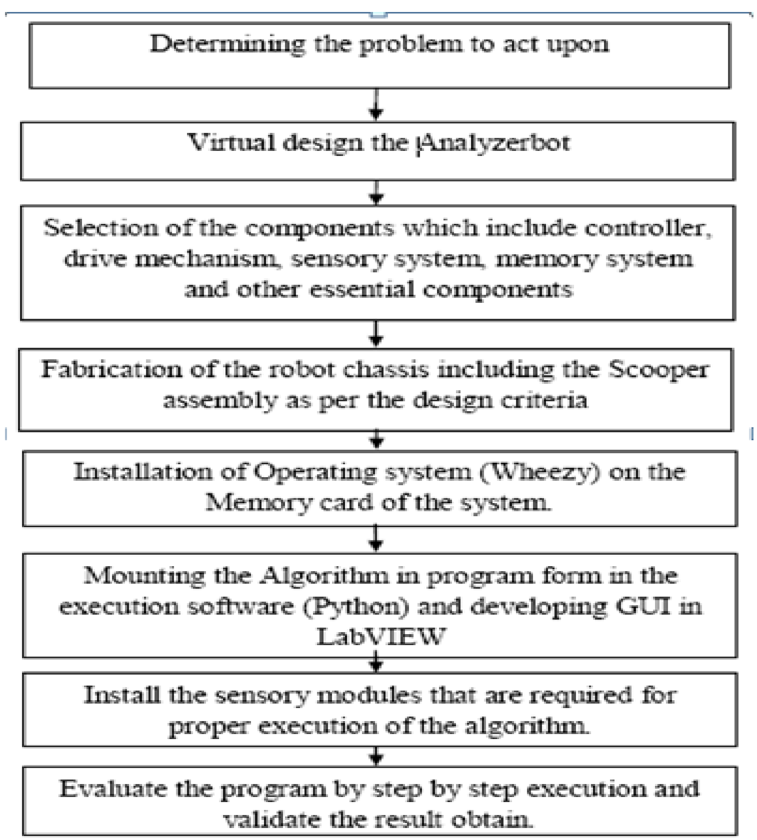

Fig.2. Project methodology

The solid works model of the robot is shown in the 6th chapter. The next step in the methodology is selection of components. Since the implementation of EKF algorithm is python is easy Raspberry pi model B is used. The motor is selected based on the weight of the robot and torque needed. The battery is chosen based on the running time required and capacity of motors. And the sensors were chosen based on the applications.The fabrication of the physical structure of the robot is made using MS 1' square hallow tube. For programming the raspberry pi the Python language is used which can directly drives the GPIO pins and the data acquired from the Accelerometer and the GPS system are transmitted using the serial communication at a baud of 9600, the acquired data is processed and transferred to the Land terminal through serial communication is made using Xbee Pro. The data is interfaced using VISA comport option in LabVIEW 2013 in the form of a string. This data is processed using various commands related to display and chart. Then circuit is connected accordingly. Finally robot has been tested and verified in real time environment.

3. SYSRTEM DESIGN

The block diagram shown in Fig.4.1 comprises mainly the control system that provides the necessary actions that are required to perform the soil sampling through the state estimation methodology. The control system consists of Raspberry pi model b version, the sensor units are interfaced with the control system with necessary signal conditioning circuitry.

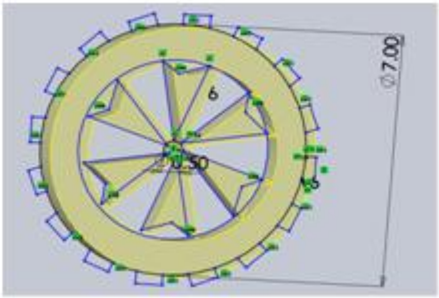

Fig.3. Wheel structure

The data transmission is a bi directional communication system with PAN ID encrypted string. The string values are received on the remote terminal provides the state of the robot. These string values are processed using string value extraction based on the position of the string number and alpha numeric values.

Sl no	Name of Device	Voltage Required (in Volts)	Current Drawn in Amperes
1	4 Motors	12	4*1= 4
2	Controller Raspberry pi	5	0.7
3	No2 Sensor	5	0.015
4	DHT -11	5	0.017
5	Ultrasonic Sensor	5	0.015
6	GPS and Accelerometer	3.3	0.05+0.02 =0.07
7	Xbee pro	3.3	0.2

Table. 1. Calculation of power source

The number of revolutions of the DC motor be N, for a minute of time the motor is N/60. In the design the motor is directly connected to the wheel causing to rotate N/60 rotations. For each rotation the distance covered is 21' based on this concept the wheel is selected. The suspension system comprises of 4

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spring s which are connected to the legs of the wheels firmly bolted on the either sides of the spring. Keeping in view of front load the total weight of the tilter mechanism along with gear and driver motor and the scooper is 9 kg vehicle suspension springs are subjected to rapid changes in length and their mass must be kept as low as possible to minimize undesirable dynamic effects.

4. RESULT ANALYSIS

The state estimation of the robot is made in Python which is a powerful tool in estimating the states of the robot based on the IMU inertial measurement unit. Each state of the robot position is calculated by an MEMS based accelerometer MMA 7341. The values obtained from the Accelerometer are generally of the form ADC which has a weightage of 1023 bits corresponding each range of analog value in this case the analog value is 5 volts which is converted into 1023 bits including 0.

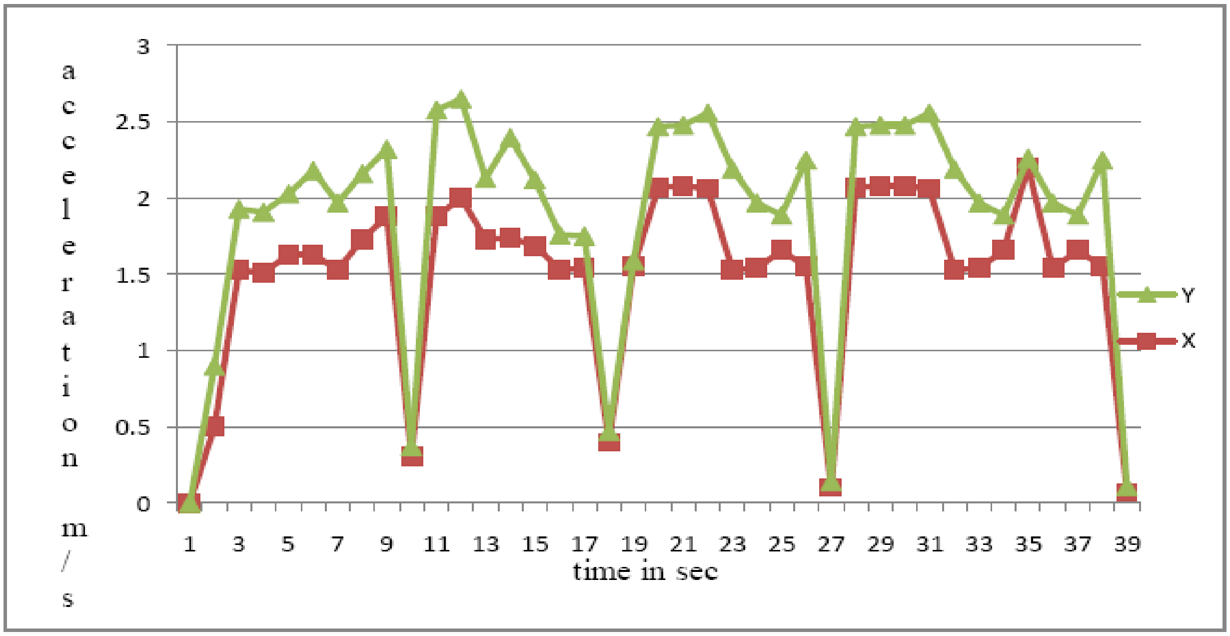

Fig.4. Graphical representation of Speed of robot at various sample points.

Each bit corresponds to 5 /1023 = 0.004 volts any change in the G values leads to change in these corresponding voltages. The execution of the steps in collection of the soil sample starts with the initial position estimation based on the location of the robot. Next robot moves to the subsequent state estimated by the EKF algorithm. The lead screw mechanism makes the tilter to reach the soil surface, the scooper rotates collecting the sample. Then again tilter reaches the home position causing the collected sample to transfer into the analyzing chamber. The sensors located in the chamber perform the analysis and the soil moves to the exit during the next operation. The above operation sequence continues until the final state of the robot is reached. The soil analysis data is transferred to the remote location for every loop iteration.

CONCLUSION

The work accomplished comprises of proposing a new approach of integrating the localization concept with the control mechanism in the real time environment for a mobile robot which is capable of extracting the samples of regolith. Hence, it can be concluded this methodology can be adapted for agricultural and other soil collection methods at various terrain lands. Application of simultaneous localization and mapping (SLAM) for better accuracy of the environment mapping. More intelligence can be incorporated in a better Processing system like ARM 9 or the latest version where the state estimations can be calculated at greater rate than the current calculation and estimation.

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