

Autonomous Omni-Directional Voice Control Pick and Place Rover

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ABSTRACT

This paper discuss about to obtain wide range coverage of a terrain vehicle design to move across the surface. This rover designed such as its sense the environment through the sensors. Main purpose of the rover is collect or picks the sample for a space research, it uses a specially designed wheel called Mecanum wheel which are used for an omni-directional movement purpose. Most of the current technology uses ordinary wheel so their movement are constrain hence using a new mecanum wheel their movement are freely in any direction. We are using Bluetooth shield module to interface with the user through android voice control application so they will not be in a fully autonomous and the error will be reduced in their movement.

Keywords: Mecanum Wheel, Wide Range Coverage and Voice Control Application.

1. INTRODUCTION

General: To obtain wide range coverage an terrain vehicle design to move across the surface. This rover designed such as the it's sense the environment through the sensors. Space rovers are used in a space research and analysis. This type of rover is used collect samples, dust and even they take pictures. Ultrasonic sensor (HC-SR04) this sensor are used determine the obstacle in the path and also the measure the distance. In this rover a four 12v DC motor is used to give a motion. It's a Multi facilities rover which is used to take the picture and collect the samples, chassis of the rover contain the automatic self-suspension system which is used to maintain the stability of the rover this will help the rover to move in terrain surface. A mechanical gripper is used to pick the samples and motion holder is used to hold the camera both are controlled by the stepper motor. IR sensor are used to detect the samples and obstacles, an Arduino MEGA is used as a controller which control all the motion and process the data. Motor drive is used as an interface between the controller, motor and gripper.

2. MECANUM WHEEL

In this rover we are using mecanum wheel. Mecanum wheel is based on the principle of a central wheel with a member of rollers placed at an angle around the periphery of the wheel. The angled peripheral roller translates a portion of the force in the rotational direction of the wheel to force normal to the wheel directional. Depending on each individual wheel direction and speed, the resulting combination of all these forces produces a total force vector in any desired direction thus allowing the platform to move freely in direction of resulting force vector, without changing the direction of the wheel. Mecanum wheel a shown in figure 1.



Figure 1: Mecanum wheel

3. DIMENSION OF THE WHEEL

In mecanum wheel it consist of a 13 cylindrical which are joined by an inclining angle of 45 degree as show in the figure.2

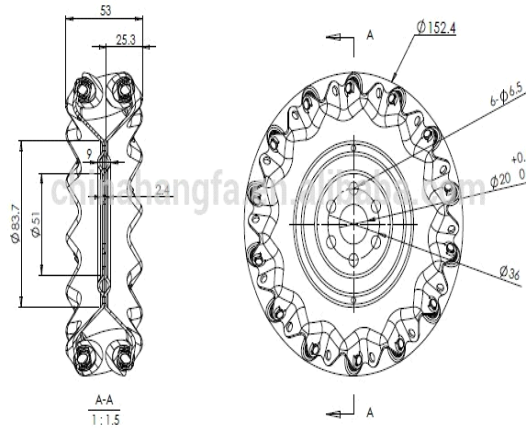


Figure 2: General dimension of wheel (All are in mm)

4. VECTOR FORCE ANALYSIS IN MECANUM WHEEL

Due to the dynamics of the mecanum wheel, it can create force vectors in both the x and y-direction while only being driven in the y-direction. Positioning four mecanum wheels, one at each corner of the chassis (two mirrored pairs), allows net forces to be formed in the x, y and rotational direction. Refer to Figure.3. A difficulty with this strategy is that there are four variables to control three degrees-of- freedom. In this case, the system is said to be over determined and it is possible to create conflicts in the actuation. As a result of the constraints associated with the mecanum wheel some form of controller is required to produce satisfactory motion. As this was a complete Mechatronic project incorporating mechanical, electronic and software development, the different areas were developed synergistically thus allowing interactions between the disciplines to be viewed and managed. It also meant that, all three core disciplines needed to be developed to a certain stage before any one area could be further worked on. Although it was physically possible to use other means to develop the core areas independently, a synergistic approach tends to be more efficient.

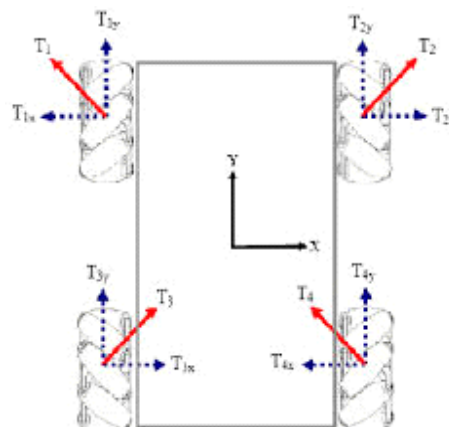


Figure 3: Vector force acting in a four wheel

5. CURRENT METHODOLOGY

Autonomous robot vehicle published by a **G. Giralt, R. Chatila, and M. Vaisset** around the year of 1990. It's based about the land based autonomous rover and self controlled system. In this they mention about what are the quality required for an autonomous rover and what are the sensors are used to measure the physical parameter and necessary input require to function the autonomous rover. A method and apparatus for moving a robotic vehicle relative to a structure. A set of tracks associated with a base of the robotic vehicle may be deployed. A number of attachment units associated with the set of tracks may be aligned with a corresponding portion of a number of structural members of the structure in a forward sequence as the set of tracks is deployed (**Gregg W.Podnar**) The number of attachment units may be secured to the corresponding portion of the number of structural members in the forward sequence. The mecanum wheel developed consist of nine rollers made from delrin. All mecanum wheels are independently powered using four units of precisian gear DC motors and the wheel/motors assemblies were mounted directly to the robot chassis made using an aluminium frame. A four channel high power H-bridge using 2 units of LMD 18200 motor drivers IC circuit was design, built and interfaced to a basicstamp (BS2) microcontroller board. Basic moility algorithm using Basicstam software is developed to test the basic mobility capabilities and test the qualities view of the systems mobility performance. Some of the technique are used are shown in bellow. To make a Omni-Directional rover embedded with ultrasonic sensor for obstacle detection and collision using Arduino MEGA. The existing methodology is depicted in a flow chart as shown in figure 4.

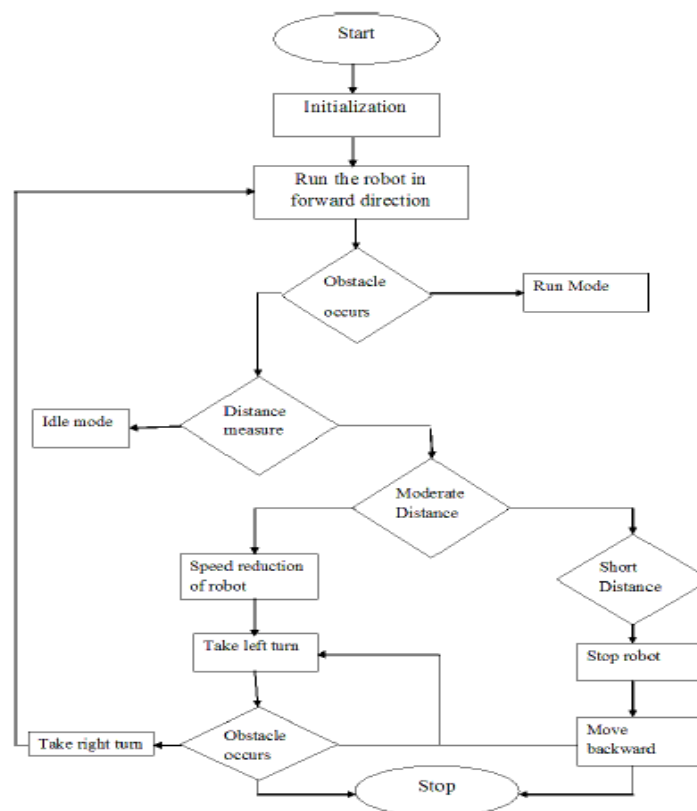


Figure 4: Existing Methodology

6. PROPOSING METHODOLOGY

In an existing system rover can only move in a left or right direction based on the output from the controller but in a proposing system rover can move in omni-direction based on the signal input from the ultra-sonic sensor. The proposed methodology of the project is depicted in flow chart as shown in figure.6. In figure.6 A,B,C & D are the indicate the four wheel of rover as shown in figure 5.

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