Autonomous Smart Cart

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Abstract- *Human-Following robots are by and large effectively inquired about for their colossal potential to do ordinary undertakings like load conveying. We are proposing a novel technique to build up a human following automated gear utilizing Bluetooth on smartphones which can work under high obstruction condition. The proposed strategy use sensors on the cell phone to evaluate the course of human activity. Hence, the Autonomous Smart Cart which evaluates the situation of target human and course of heading and adequately will follow the individual was actualized utilizing Bluetooth. Cart incorporates a GPS, Compass and Bluetooth module that helps arrange the cart and enables you to know the co-ordinates of it consistently.*

Keywords- Arduino microcontroller, GPS, Compass, Autonomous Robot, Bluetooth, Smart Phone, Cart.

I. INTRODUCTION

Automation is the utilization of machines, control frameworks and data advancements to improve efficiency in the generation of products and conveyance of administrations. It is the utilization of control frameworks and data advancements to diminish the requirement for human work in the creation of merchandise and enterprises. In the extent of industrialization, computerization is a stage past motorization. Computerized load conveying framework is presented which moves the baggage from point A to B.

Customary load conveying framework is both tedious and labour intensive. At the same time, it is a costly procedure and extremely slow. The proposed Automated System for load conveying framework can give those highlights expected to conquer the issues referenced previously. The framework comprises of robotized vehicles that can be obtained and it naturally pursues the borrower inside a foundation with baggage. In this theory we have distinguished the essential development required for the three wheels based inflexible robot body and the basic person tracking movement of the borrower for load carrying.

II. LITERATURE REVIEW

Numerous analysts have taken a shot at human following robots a summary of the work done by them is introduced underneath. Christian Schlegel et al. have investigated on a robot with a stereo camera with real-time requirements,

With the shifting environment, changing light conditions and shape as a measure for the individual to be followed. It was tried effectively in an office workspace. It utilizes different sensors for impact evasion however it was neglecting to particularly distinguish a man in a bunch [9]. Sarmad Hassan et al. have settled above issue by taking the colour tag to particularly distinguish the individual to pursue which essentially enhanced the execution of the following framework [10].

T. Wilhelm et al. have utilized a likewise approach as Christian Schlegel for human following issue, they combined sensor data from sonar and stereo camera to improve the execution of the algorithm which pursues the human movement [11].

Masahito Ota et al. have built up a recuperation function for vision based framework based on modelling the trajectory followed by humans while they were in the field of view. Utilizing prognostic strategies on the picture information to recognize corners in the way of human, to anticipate if the individual turned or not. They found that direction of human movement can be displayed as a logarithmic function when a human is making a turn. The test results demonstrated that robot can re-gain the target even when it loses sight of the target at the corner with distance error between anticipated position and the estimated position was under 0.65 m [12]. Shu Liu et al. have dealt with proximity estimation utilizing RSSI of Bluetooth on Smartphone and equated them with positioning strategies utilizing Wi-Fi and GPS. They report the precision of 1.5 m from the genuine position after using averaging smoothing filter on the measured values of RSSI. They additionally revealed longer battery time of Bluetooth against GPS and Wi-Fi in both Indoor and Outdoor conditions [17].

III. SYSTEM IMPLEMENTATION AND VALIDATION

The Autnomous Smart Cart will be a cart that will pursue the client all through any level surface without the need of the client to utilize power to drag it. No exertion will be connected by the client so as to convey diverse load extents.

A. Objectives

- A robot simple to be utilized and to be manageable by any individual.
- A remote framework made of a transmitter part and a receiver part associated with the cart.
- A sound structure and base plan to oppose load, distinctive temperatures, and external forces.
- A security framework that the client can be free of stresses of his or her cart being stolen or left behind.

B. Form And Functionality

The movement estimation module is utilized to send movement directions to Arduino to activate the robot. On getting the RSSI and IMU esteems it gauges the course and separation of focus as for the robot and after that sends the movement directions dependent on target's position. The state outlinefor the movement estimation module is given beneath in the diagram**.**

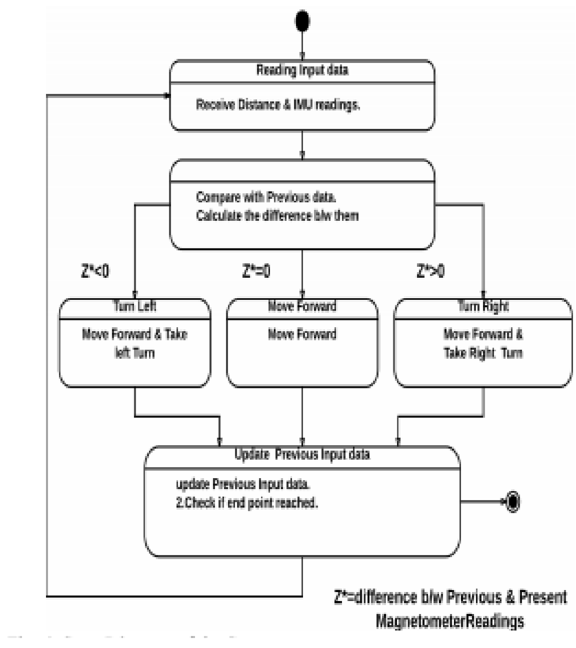

Fig.1. State diagram of the system

In the present model just forward development, left and right turn movements are utilized to approve the human following. As the Arduino gets the movement directions it executes them by the motor controller dependent on the information PWM (Pulse Width Modulation). At the point when Adruino gets the RSSI and IMU magnetometer esteems, first it changes RSSI into distance utilizing a log path model when RSSI is more noteworthy than - 65 dBm and polynomial model when RSSI is not exactly - 65 dBm.

At that point it contrasts them and the past estimations of separation and IMU values and figures the distinction between them.There are 3 conceivable situations with the distinction in IMU magnetometer values, they are:

1. The variation is less than set threshold considered zero, at that point just straight line movement is executed by controlling both the motors similarly.
2. The variation is Positive considered as Left turn, and later straight line movement is executed to cover past distances after that Left turn is executed by driving right motor.
3. The variation is Negative considered as Right turn, and afterward straight line movement is executed to cover past distances after that Right turn is executed by driving right motor.

Forward motion and Turning motion algorithm are given below :

Algorithm 1 Algorithm for Forward Movement
Input: Distance Estimate, Previous Distance Estimate, Previous Difference
Output:Stop/Accelerate/Slowdown
Initially Previous Distance estimate and Previous difference are taken as zero
Initialization

```
if (DistanceEstimate ≤ 50) then
    Stop
else
    PresentDifference ← (DistanceEstimate − PreviousDistanceEstimate)
    if (PresentDifference > PreviousDifference) then
        Accelerate
    else
        Slow Down
    end if
end if
PreviousDifference ← PresentDifference
PreviousEstimate ← DistanceEstimate
Repeat until Switched off
```

Fig.2. Forward movement algorithm

Algorithm 2 Algorithm for Turning Motion
Input: IMU Values
Output:Straight line motiom/Turning motion
Initially Previous IMU values are taken as zero
Initialization

```
Calculate the Present direction of Heading from IMU Accelerometer sensor values
Difference ← (PresentHeading − PreviousHeading)
if (Difference = 0) then
    Straight Line Motion
else
    Turning Motion
end if
PreviousHeading ← PresentHeading
Repeat until Switched off
```

Fig.3. Turning movement algorithm

A. System Description

The proposed system consists of Bluetooth enabled smart phone, Arduino micro controller, Motor and its drivers. This project explicitly concentrates of following the subject avoiding all the obstacles in its way. Given below is the component diagram of the proposed system :

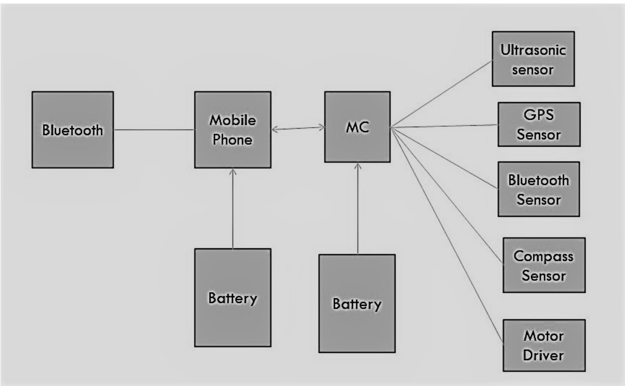

Fig.3. Component Diagram

VI. CONCLUSION

In this paper, we have formulated a methodology that establishes a connection between the user device using bluetooth on the smartphone and the bluetooth module incorporated on the microcontroller which is, the Arduino. The IMU sensors on the smartphone will help to evaluate the course of human activity in co-ordination with the various sensors such as GPS,Compass and Bluetooth for data transfer between the Autonomous Smart Cart and the User Device. This project will help to overcome the traditional method of carrying luggage requiring human efforts with a revolutionary automation method thereby helping the disabled and senior members of the society at large. This unique automation will prove as a boon to the sectors where it is impossible for humans to perform operations using traditional methods and thus provide an unimaginable aid in the commercial sectors.

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