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Human Following Robot Using Arduino Uno

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ABSTRACT: This paper develops a compressed infrared motion sensing system for mobile robots to detect and localize a moving human target in the vicinity. The proposed sensing system consists of three compressed infrared bearing sensor arrays for generating the bearing measurements of a human target from three perspectives. Then, human location is inferred by fusing these bearing measurements with least square method. The bearing sensor array is composed of pyroelectric infrared (PIR) sensors, and we employ the compressed sensing paradigm for the bearing sensor array design for reducing the number of required PIR sensors. A sensing system prototype is developed and evaluated in the context of human-following with robots.

I. INTRODUCTION

In recent years, service robotics have attracted considerable attention as they can assist human beings to perform many daily jobs such as carrying luggage in supermarket or railway station, tour guiding in museum [1], [2]. One of the fundamental tasks for service robotics is to detect and localize the human target to be served [3]–[11]. In robotics, various sensing systems for human motion localization are based on acoustic sensors [12], ultrasonic sensors [13], and optical image sensors [14]. However, for acoustic and ultrasonic sensors, the applicability is limited due to lacking ability to distinguish human target from other objects. For optical image sensors, on one hand, they require sophisticated computer vision algorithms for feature extraction [15]; on the other hand, they are highly sensitive to the illumination and background changes [16]. Thus, the optical image sensors have the limitations in human motion localization

Fig.Prototype model of a human following robot

with mobile robots as well. The PIR sensors are preferable for human motion sensing, because they are sensitive to infrared changes induced by human motion but robust to environmental changes [17]–[22]. Recently, many studies [23]–[26] have shown that PIR sensor arrays with modulated Fresnel lens arrays are capable of infrared motion sensing with high sensing efficiency, especially, in detecting and localizing human targets. In our pervious studies [27], [28], we have developed an infrared motion sensing system for human motion localization with mobile robots. `

HARDWARE COMPONENT-

1.Aruino Uno
2.l293D Motor with shield
3.Dc gear motor with wheels
4.HC-SR04 Ultra sonic sensor module
5.infrared sensor bords
6.Volts lithium ion battery pack
7.switch

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1.Arduino Uno-The Arduino Uno is an open –source microcontroller board based on the microchip ATmega 328 p microcontroller an developed by arduino.

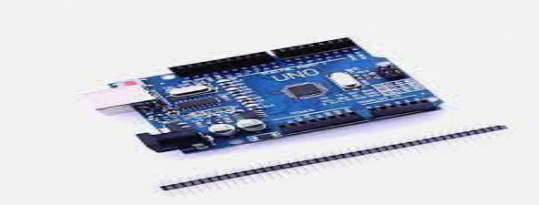

Fig. Arduino Uno

2.293D Motor with shield-

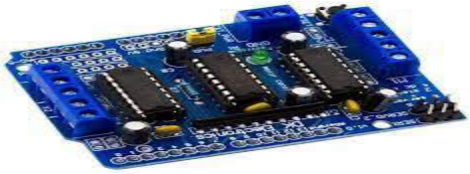

Fig.293D motor with shield

The motor shield is a driver module for motors that allows you to use arduino to control the working speed and direction of the motor**.**

3.DC GEAR MOTOR-

Fig.Dc gear motor

A gear motor is an all in one combination of a motor and gearbox.The adition of a gear head to a motor reduces the speed wheel increasing the torque output.

4.HC SR04 ULTRASONIC SENSOR MODULE-

Fig.-HC SR04 ULTRASONIC SENSOR MODULE

Ultrasonic sonic sensor module HC-Sr04 a ultrasonic sensor.include an ultrasonic transmitter ,a receiver and a controlunit.

5.Infrared sensor boards-

Fig.Sensor boards

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An infared sensor boards can detect movement as well as to measure the heat of an object.

6.Volts Lithium –ion battery pack-

Fig.-ion battery pack

The nomal voltage of lithium –ion is 3.60/cell.some cell manufactures mark their Li-ion as 3.70v/cell or higher .

7.Switch-

Fig.switch

A Small button or something similar that you press up or down in order to turn on electricity.

III. CONCLUSION

This paper presents a compressed infrared motion sensing system for human-following robots. The sensing system is composed of three infrared bearing sensor arrays. We employ the compressed sensing paradigm for the design of the bearing sensor arrays. Specifically, the MS-UD code is proposed for the sensor array design. Compared with isomorphic sensing paradigm, the compressed sensing paradigm (MS-UD code) can significantly reduce the number of PIR sensors in constructing the bearing sensor array/sensing system. The experimental results have shown that the proposed sensing system is robust to environmental changes and computationfriendly. Hence, the proposed infrared motion sensing system has prominent advantages in the mobile sensing applications. In the future work, we will focus on the human-following task in complex environment, and will develop algorithms for fusing the sensing data from our proposed sensing system and other sensors such as camera.

IV. FUTURE WORKS

A new approach for a human-following robot is proposed. Using infrared lights as artificial landmarks is developed in some researches such as]. The useful application is using this system in gentle light environment where grey or color CCD cameras are limitative. Nintendo Wii infrared camera is used in this research. The advantage of this camera is its low cost so that this research could be applied in real life such as in automatic following cart in super markets. Future research is to integrate an inertial sensor for improving the accuracy of the system and avoiding losing position when IR-LEDs are out of camera's range of view.

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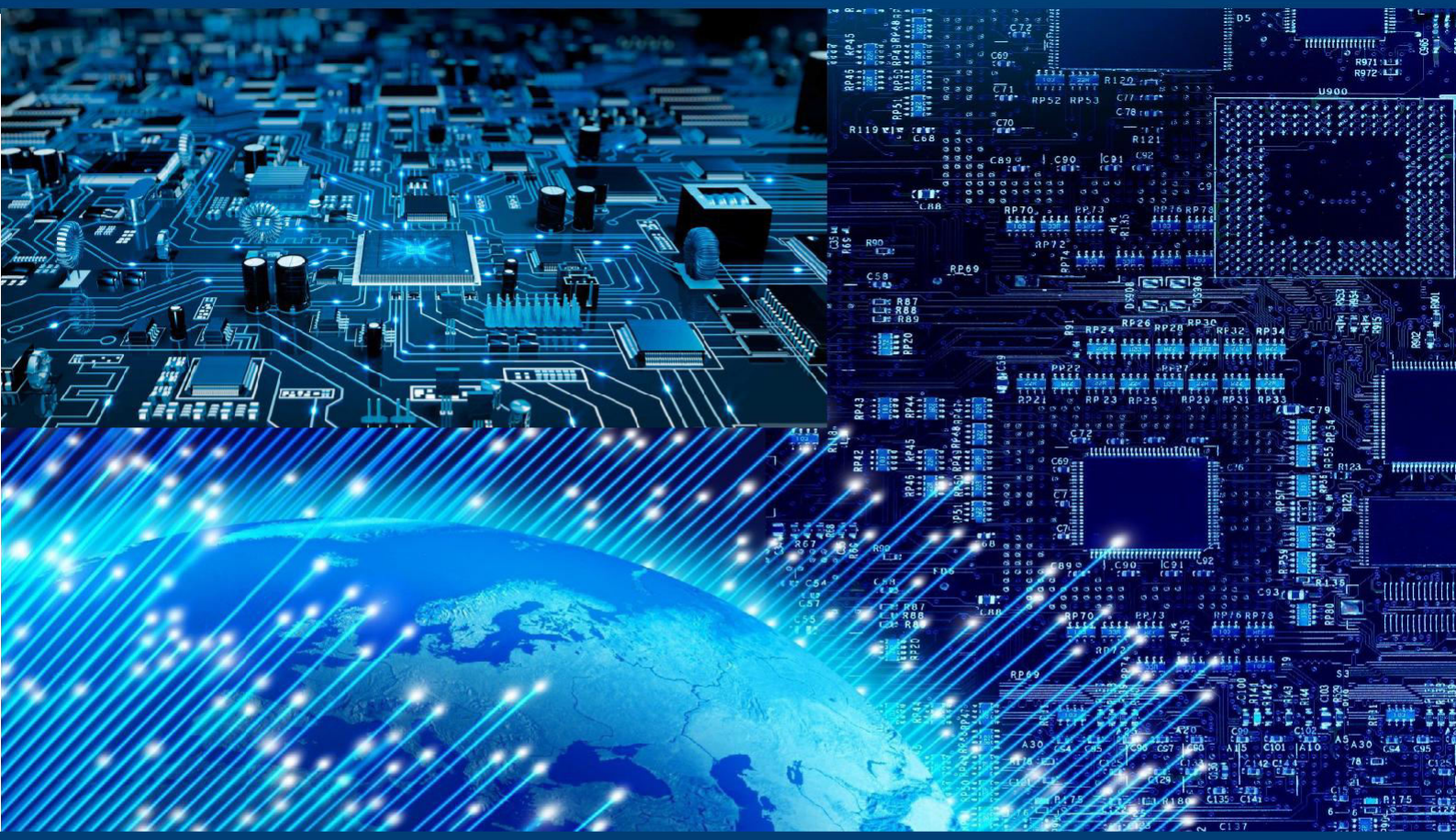

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