INTELLIGENT HUMANOID LEGS

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ABSTRACT

There are a number of reasons to be interested in building humanoid robots. They include (1) since al- most all human artifacts have been designed to easy for humans to interact with, humanoid robots provide backward compatibility with the existing human constructed world, (2) humanoid robots provide a natural form for humans to operate through telepresence since they have the same kinematic design as humans themselves, (3) by building humanoid robots that model humans directly they will be a useful tool in understanding how humans develop and operate as they provide a platform for experimenting with different hypotheses about humans and (4) humanoid robots, given salient abilities, will present a natural interface to people and people will be able to use their instinctive and culturally developed sub- conscious techniques for communicating with other people to communicate with humanoid robots. In this paper we take reason (4) seriously, and examine some of the technologies that are necessary to make this hope a reality. Humans are the most advanced creatures of the nature. I believe that humanoid robots will be the most advanced creatures of humans. Among the man-made creatures such as automobile, hand-phones and multimedia devices, robots of future will hopefully be the most ideal assistants to human beings. Robots can live up to this expectation because future intelligent and autonomous robots could free humans from, or ease them up of, repeatedly undertaking physically and mentally challenging routines.

For instance, Robot Doctor could provide medical advices, pre-diagnostic, and even assist in surgical operation; Robot Nurse could assist patients in hospital or at home; Robot Soldier could participate in military intervention, and even fight terrorism; Robot Tutor could help our students to have a better learning experience; Robot Guard could make our society much safer; Robot Maid could keep our house clean and secure, and even help look after elderly people at home; Robot Rescuer could be deployed to places where human lives are in danger. The list of potential applications with intelligent and autonomous robots is growing.

Keyword: - *Humanoid, Sub- conscious techniques,*

1. Introduction

A **humanoid robot** is a robot with its body shape built to resemble that of the human body. A humanoid design might be for functional purposes, such as interacting with human tools and environments, for experimental purposes, such as the study of bipedal locomotion, or for other purposes. In general, humanoid robots have a torso, a head, two arms, and two legs, though some forms of humanoid robots may model only part of the body, for example, from the waist up. Some humanoid robots also have heads designed to replicate human facial features such as eyes and mouths. Androids are humanoid robots built to aesthetically resemble humans

Fig 1.1: Humanoid Robot

Humanoid robots are now used as a research tool in several scientific areas. Researchers need to understand the human body structure and behavior (biomechanics) to build and study humanoid robots. On the other side, the attempt to the simulation of the human body leads to a better understanding of it. Besides the research, humanoid robots are being developed to perform human tasks like personal assistance, where they should be able to assist the sick and elderly, and dirty or dangerous jobs. Regular jobs like being a receptionist or a worker of an automotive manufacturing line are also suitable for humanoids.

2. Description

A humanoid robot is a robot with its overall appearance based on that of the human body. In general humanoid robots have a torso with a head, two arms and two legs, although some forms of humanoid robots may model only part of the body, for example, from the waist up.

What is the difference between a robot and an android?
An android is a robot or synthetic organism designed to look and act like a human, especially one with a body having a flesh-like resemblance. Until recently, androids have largely remained within the domain of science fiction, frequently seen in film and television

Necessity of Humanoids

- Are there any good reasons for doing research on humanoid robots?
  - Work in dangerous environments
  - Exhaustive and repetitive tasks.
  - Division of labor with humans in cooperative tasks
  - Anthropomorphism
  - Embodiment
  - Interaction and Communication

- Anthropomorphism

- Humans have built complex environments, tools and equipment's very much adapted to ourselves.
- Robots with human-like morphology and motion capabilities have a greater potential acting in living environments created for humans, than e.g. wheeled robots. Embodiment
- The form of our *bodies is critical to the* representations that we develop and use for both our internal thought and our language.
- If we are to build a robot with human like intelligence then it must have a human like *body in order to be able to develop similar* sorts of representations.
- Important aspects of being human are *interaction and communication with other* humans.
- Humanoids can *communicate in a manner that* supports the natural communication modalities of humans. Examples include: facial expression, body posture, gesture, gaze direction, and voice.
- If a robot has humanoid form, then it will be both easy and natural for humans to *interact with it in a humanlike* way.

3. Implementation

1. ARDUINO:-

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard

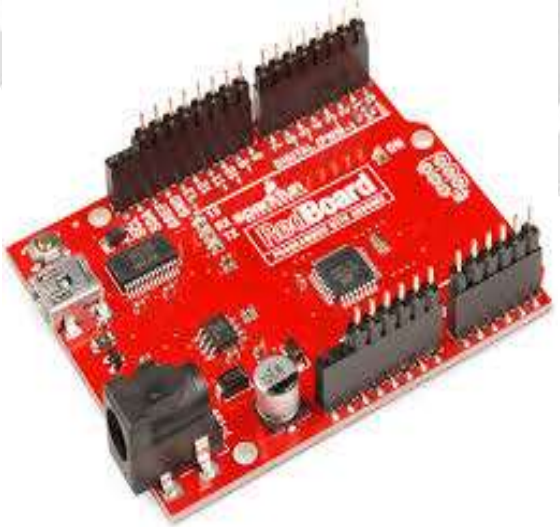


Fig 3.1: Arduino Board

form factor that breaks out the functions of the micro-controller into a more accessible package.
The Uno is one of the more popular boards in the Arduino family and a great choice for beginners.

FIG: ARDUINO BOARD

Features:

- ATmega328 microcontroller with Opti-boot (UNO) Boot loader
- USB Programming Facilitated by the Ubiquitous FTDI FT232RL
- Input voltage - 7-15V
- 0-5V outputs with 3.3V compatible inputs
- 14 Digital I/O Pins (6 PWM outputs)
- 6 Analog Inputs
- 32k Flash Memory
- 16MHz Clock Speed
- All SMD Construction
- R3 Shield Compatible
- Red PCB!

2. SERVO MOTORS:-

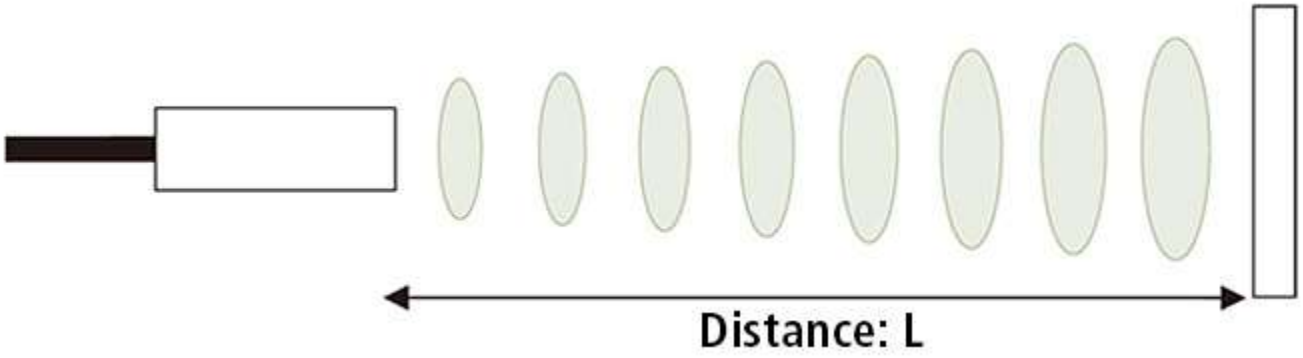
A **servomotor** is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

Servomotors are not a specific class of motor although the term *servomotor* is often used to refer to a motor suitable for use in a closed-loop control system. Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing.

FIG3.2. SERVO MOTOR

3. ULTRA SONIC SENSORS

The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception.



An optical sensor has a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception. In a reflective model ultrasonic sensor, a single oscillator emits and receives ultrasonic waves alternately. This enables miniaturization of the sensor head.

Distance calculation

The distance can be calculated with the following formula:

Distance L = 1/2 × T × C

where L is the distance, T is the time between the emission and reception, and C is the sonic speed. (The value is multiplied by 1/2 because T is the time for go-and-return distance.)

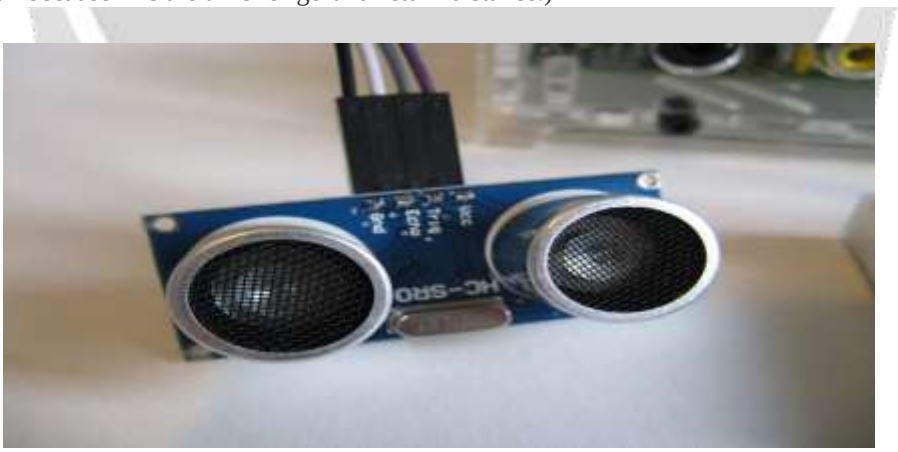


Fig 3.1: Ultra Sonic Sensor

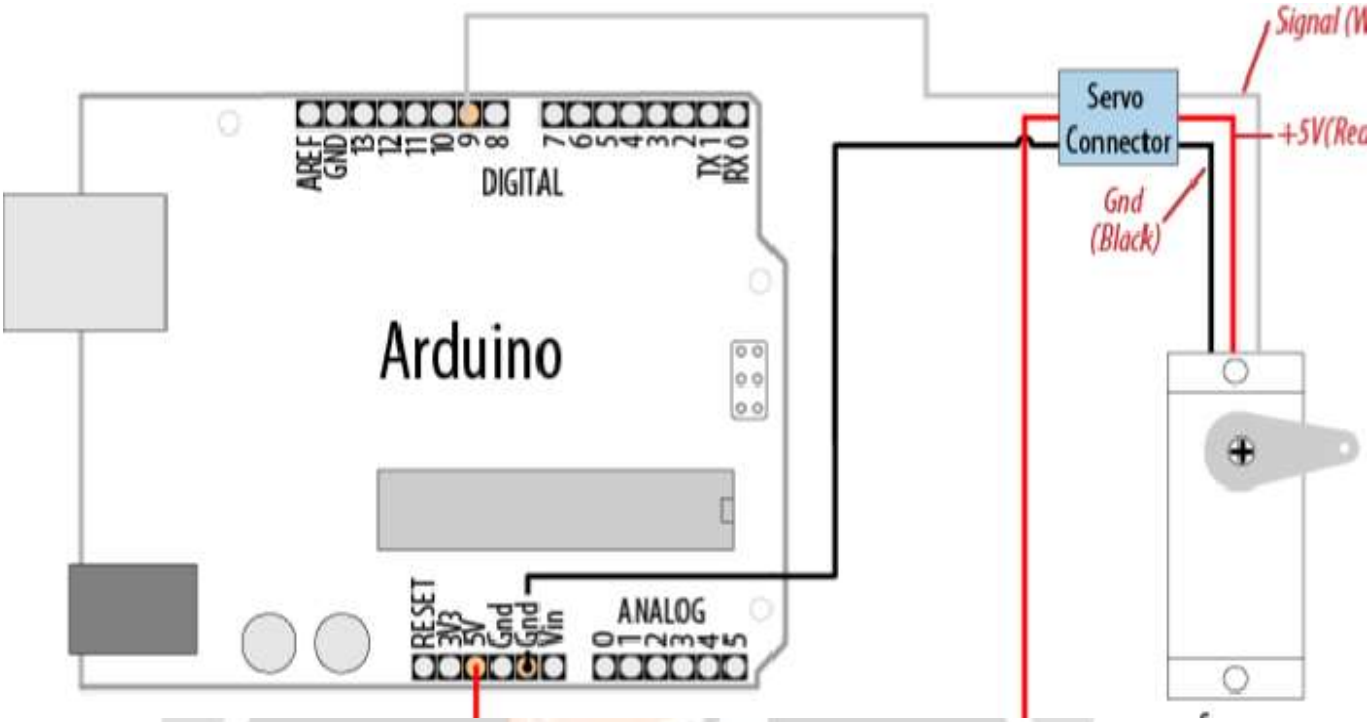


FIG 3.3 SERVO MOTOR INTERFACED WITH ARDUINO BOARD

4. PROGRAMMING

Servo Calibration

```
String readString;
#include <Servo.h>
Servo myservoa, myservob, myservoc, myservod;  // create servo object to control a servo

void setup() {
  Serial.begin(9600);

  //myservoa.writeMicroseconds(1500); //set initial servo position if desired

  myservoa.attach(6);  //the pin for the servoa control
  myservob.attach(7);  //the pin for the servob control
  myservoc.attach(8);  //the pin for the servoc control
  myservod.attach(9);  //the pin for the servod control
  Serial.println("multi-servo-delimit-test-dual-input-11-22-12"); // so I can keep track of what is loaded
}
```

```
void loop() {

 //expect single strings like 700a, or 1500c, or 2000d,
 //or like 30c, or 90a, or 180d,
 //or 30c,180b,70a,120d,

 if (Serial.available())  {
  char c = Serial.read();  //gets one byte from serial buffer
  if (c == ',') {
   if (readString.length() >1) {
    Serial.println(readString); //prints string to serial port out

    int n = readString.toInt();  //convert readString into a number

    // auto select appropriate value, copied from someone elses code.
    if(n >= 500)
    {
     Serial.print("writing Microseconds: ");
     Serial.println(n);
     if(readString.indexOf('a') >0) myservoa.writeMicroseconds(n);
     if(readString.indexOf('b') >0) myservob.writeMicroseconds(n);
     if(readString.indexOf('c') >0) myservoc.writeMicroseconds(n);
     if(readString.indexOf('d') >0) myservod.writeMicroseconds(n);
    }
    else
    {
     Serial.print("writing Angle: ");
     Serial.println(n);
     if(readString.indexOf('a') >0) myservoa.write(n);
     if(readString.indexOf('b') >0) myservob.write(n);
     if(readString.indexOf('c') >0) myservoc.write(n);
     if(readString.indexOf('d') >0) myservod.write(n);
    }
    readString=""; //clears variable for new input
   }
  }
```

```
    else {
      readString += c; //makes the string readString
    }
  }
}
```

.

5. Result

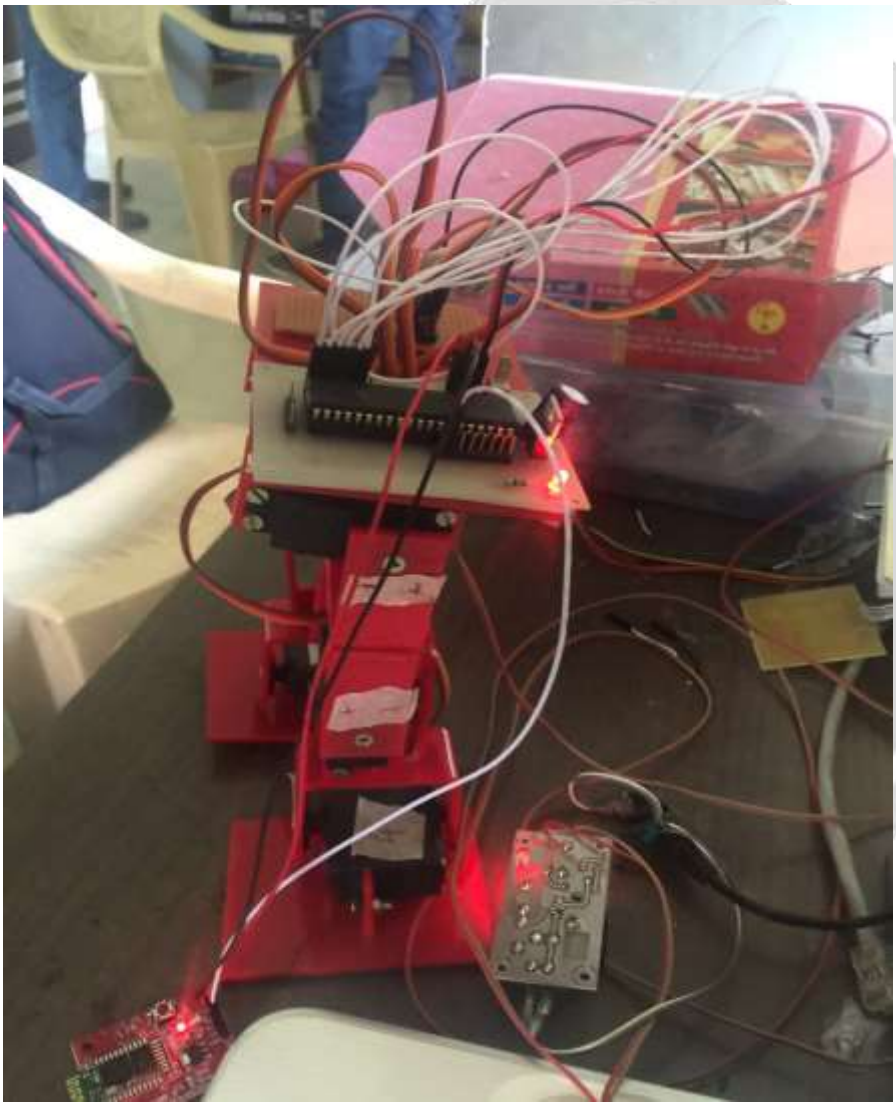


Fig 5.1 Humanoid Legs

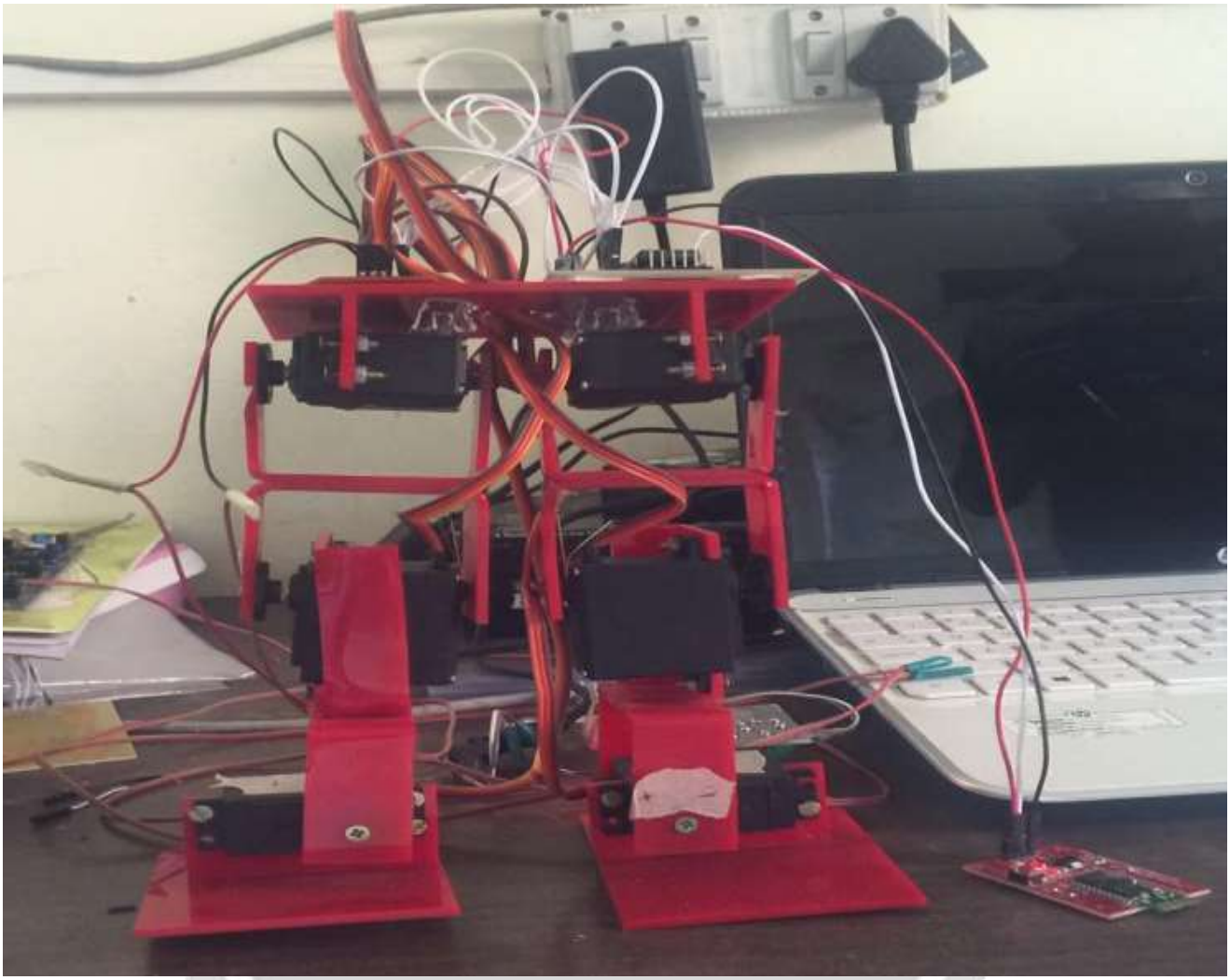


Fig 5.2 Humanoid Legs

6. ACKNOWLEDGEMENT

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6. REFERENCES

1] Arkin, Ronald C. (1998). Behavior-Based Robotics. MIT Press.
2] Brady, M., Hollerbach, J.M., Johnson, T., Lozano-Perez, T. and Mason, M. (1982), Robot Motion: Planning and Control. MIT
3] Horn, Berthold, K. P. (1986). Robot Vision. MIT
4] www.arduino.cc
5] spectrum.ieee.org/robotics/humanoids
6] cs.calstatela.edu/wiki/images/c/cb/Humanoid_Robots.ppt