Help Robotic System  
(HRS001)

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Abstract

The purpose of this project was to design, implement and program a robotic hand named HRS (Help Robotic System). This robotic system has the appearance and ability to behave similar to a human hand. It was developed using concepts from robotics and biomechanics. Our focus was to develop a HRS prototype that has the ability to attach objects for a period of 10 seconds. We used the Arduino Uno® microprocessor and implemented basic algorithm of motion. Other electronic components were used to facilitate the movement of the hand in addition to the microprocessor. For example, the use of servomotors, that are responsible for the movement of the fingers of the HRS. In this first stage we designed, constructed and tested the prototype (HRS001) which supports our hypothesis. The external part of the system was made with Puerto Rican mahogany wood. As future work, we expect to improve current design and produce new versions of Help Robotic System, a robotic hand that can be used as part of a robotic prosthesis for children and young people, allowing them to do used as a real hand.

1 Objectives

Develop an artificial hand using robotic technology and biomechanics:
• Run and perform movements similar to the human hand.
• Hold an object determined by the experiment over a period of 10 seconds.

2 Problem

Can Help Robotic System be capable of holding a particular object for a period of at least seconds and move similar to the human hand?

3 Hypothesis

The prototype of the HRS001 robotic can hold a determined object by a set period of time.

4 Materials

<table>
<thead>
<tr>
<th>Material</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country wood; mahogany.</td>
<td>Arduino Uno®</td>
</tr>
<tr>
<td>Nails 3/32</td>
<td>Servo Motors (x 5)</td>
</tr>
<tr>
<td>Screws for wood (48 x)</td>
<td>Test Board (X1)</td>
</tr>
<tr>
<td>Nylon</td>
<td>Power cords (x 30)</td>
</tr>
<tr>
<td>Wood PuTTY(paste)</td>
<td>Arduino servo shield</td>
</tr>
<tr>
<td>Mineral oil</td>
<td>Power supplier; 5v 2000 mAh</td>
</tr>
<tr>
<td>Basin of wood (x 5)</td>
<td>Rubber band</td>
</tr>
</tbody>
</table>

Table 1: Material list

5 Program

```c
void setup() {
  Serial.begin(9600);
  Serial.print("Servo test!");
  pwm.begin();
  pwm.setPWMFreq(60);
  // Analog servos run at ~60 Hz updates
  if (analogRead(0) > 200) Serial.println("Failed to set the pwm for Finger_Pulgar_1 attach(2)/setting_to_the_pwm_for_Finger_Pulgar_1 attach(2)");
}

void loop() {
  //check if the grade of the Servo Finger_Pulgar_1 is 0
  if (analogRead(2) > 200) Serial.println("Failed to set the pwm for Finger_Pulgar_1 attach(2)/setting_to_the_pwm_for_Finger_Pulgar_1 attach(2)");

  //delay(1000);
  //delay(1000);
  //delay(1000);
}
```

Figure 1: Biomechanical hand development

6 Prototype Design

Design and implementation of biomechanical hand software and hardware

7 Building Process

Assembly hand and electronic hardware

Running and Testing

Figure 3: Detailed Process

8 Conclusions

The process of construction of our prototype was time demanding and we learned about robotics, biomechanics and Arduin®, behind other topics. In the process of experimentation we could see how HRS behaved, which will allow us to improve the HRS001 to ensure better accuracy, and continue with the next phase. We ran the experiment and our prototype was able to hold objects for the required time. In the future, project goal is to help design an effective robotic prosthesis that can be used by children with some kind of motor problem.

Bibliography


