

Department of Mechanical, Aerospace and Manufacturing
Engineering

Wire Routing Tool

ME 3483
Mechatronics
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Group 2
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[Overview]

- Problem Description
- Introduction
- Mechanical Design
- Electrical Design
- Software
- Mathematical Analysis
- Cost Analysis
- Mass Production
- Project Analysis
- Conclusion
- References

[Problem Description]

- Working in a finished wall
- Currently requires ripping up the wall
 - Cost
 - Labor
 - Damage to the wall

[Introduction]

- Goal: To design and build a wire routing tool
 - Minimize damage to finished walls
 - Lower cost and labor associated to current method

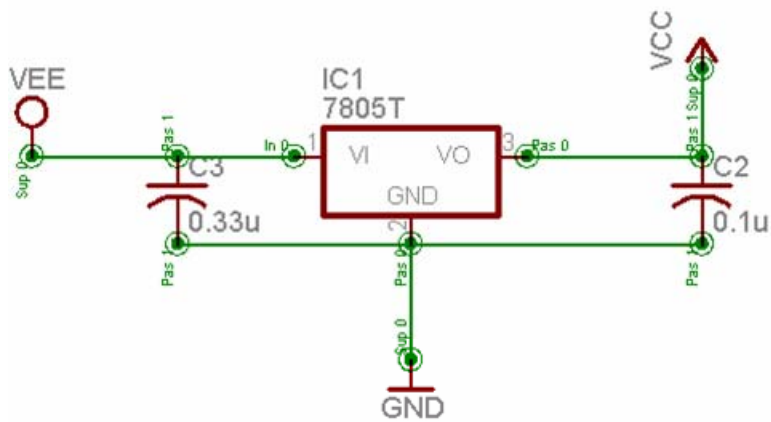
[Mechanical Design]

- Drill Motor – 12 V DC
- Drive Motor – Lego Mind-Storm Kit Motor
- Balancing Arms – Spring loaded guiding arms controlled by servo motor

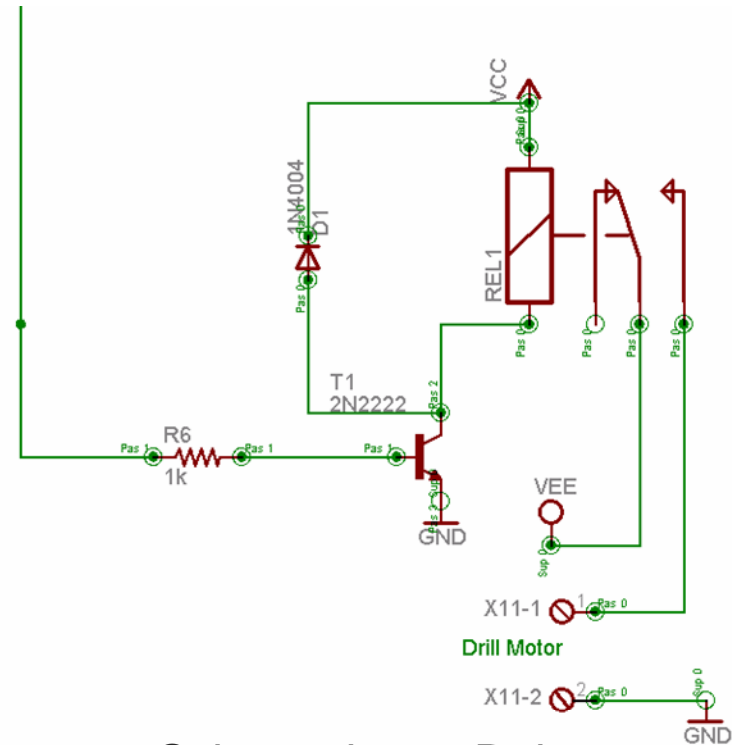
[Electrical Design]

- Sensors
 - Range Sensor
 - Hall-Effect Sensor
 - Temperature Sensor
 - Touch Sensors
- H-Bridge
- Relay
- Regulator
- LCD Display for User Interface
- I/O 's

Schematics

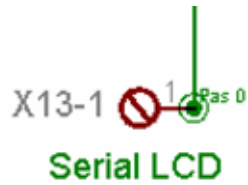


Schematic 1 – Regulator

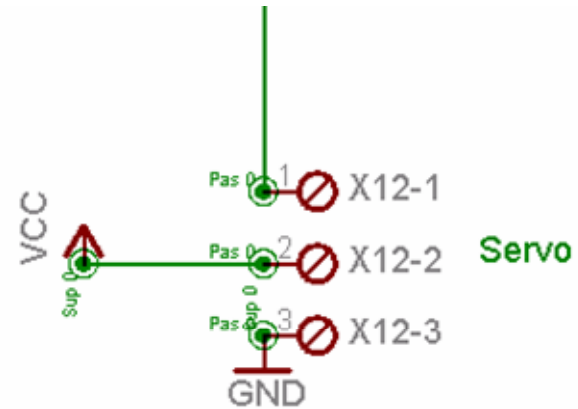


Schematic 2 – Relay

[Schematics]

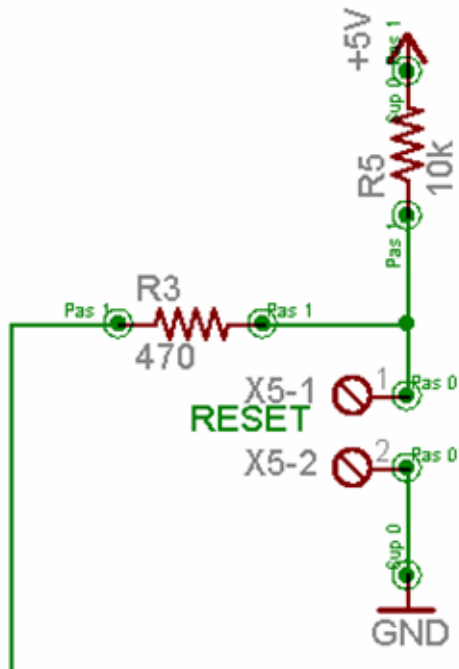


Schematic 3 – LCD Display (Note: this is just the serial transmission line. Power supply for Serial LCD is (+5 volts and ground) are bussed back.

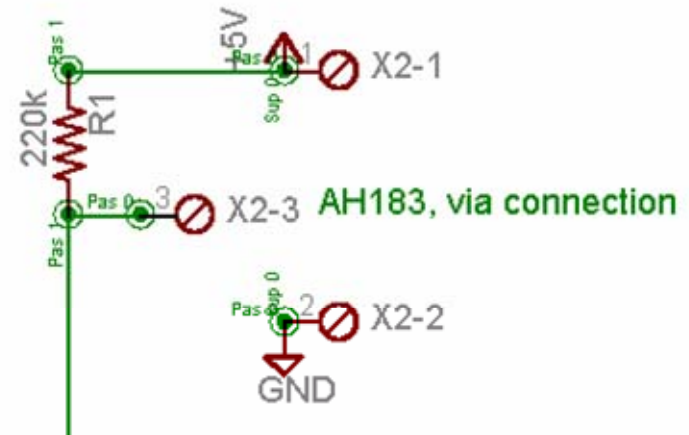


Schematic 4 – Servo motor for stabilizer arms

Schematics

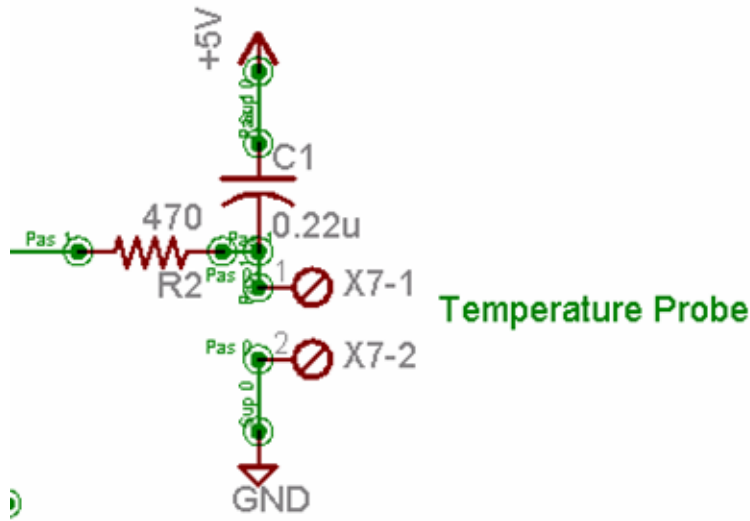


Schematic 5 – Reset function (Note: Performs same function available on Board of Education. Since the Board of education will not be used for Mass production, this was made available)

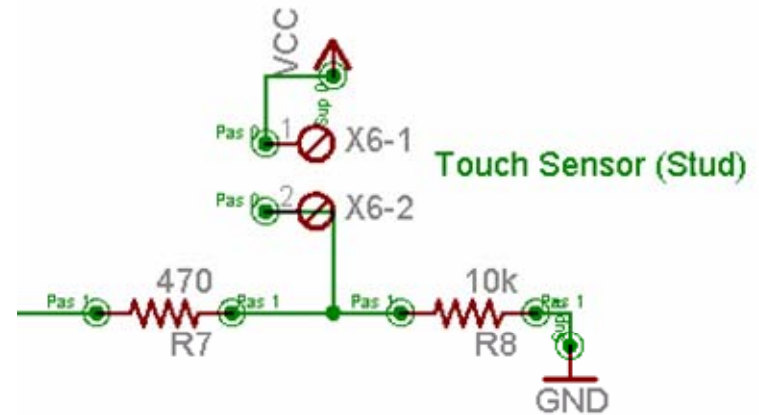


Schematic 6 – Hall Effect switch

[Schematics]

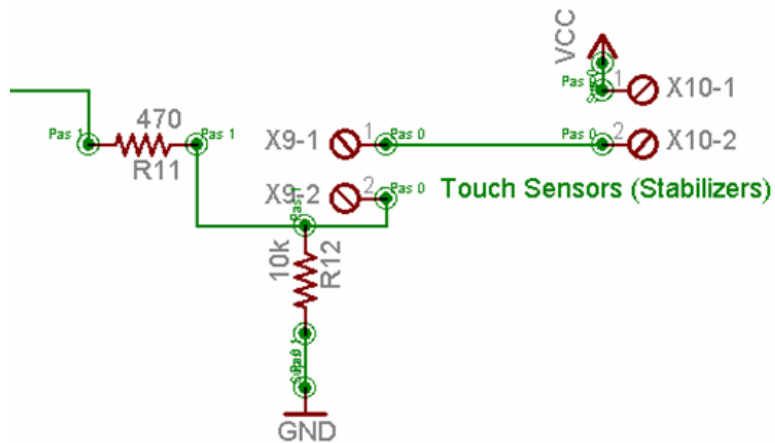


Schematic 7 –Temperature Probe

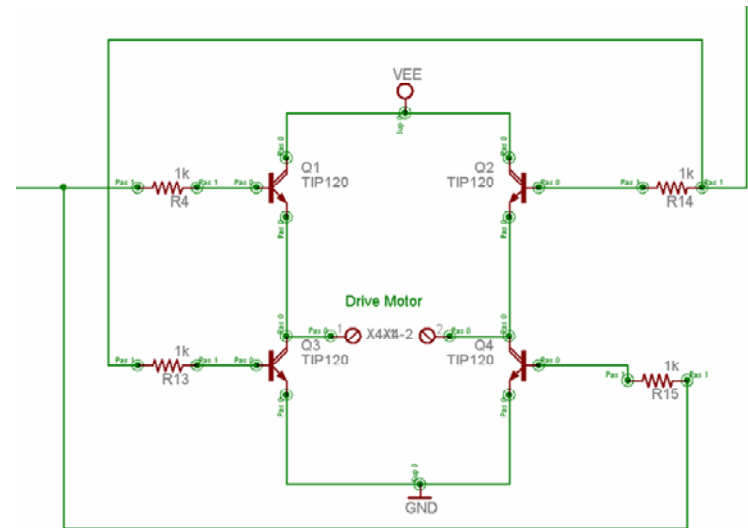


Schematic 8 – Touch Sensor for Stud detection

Schematics



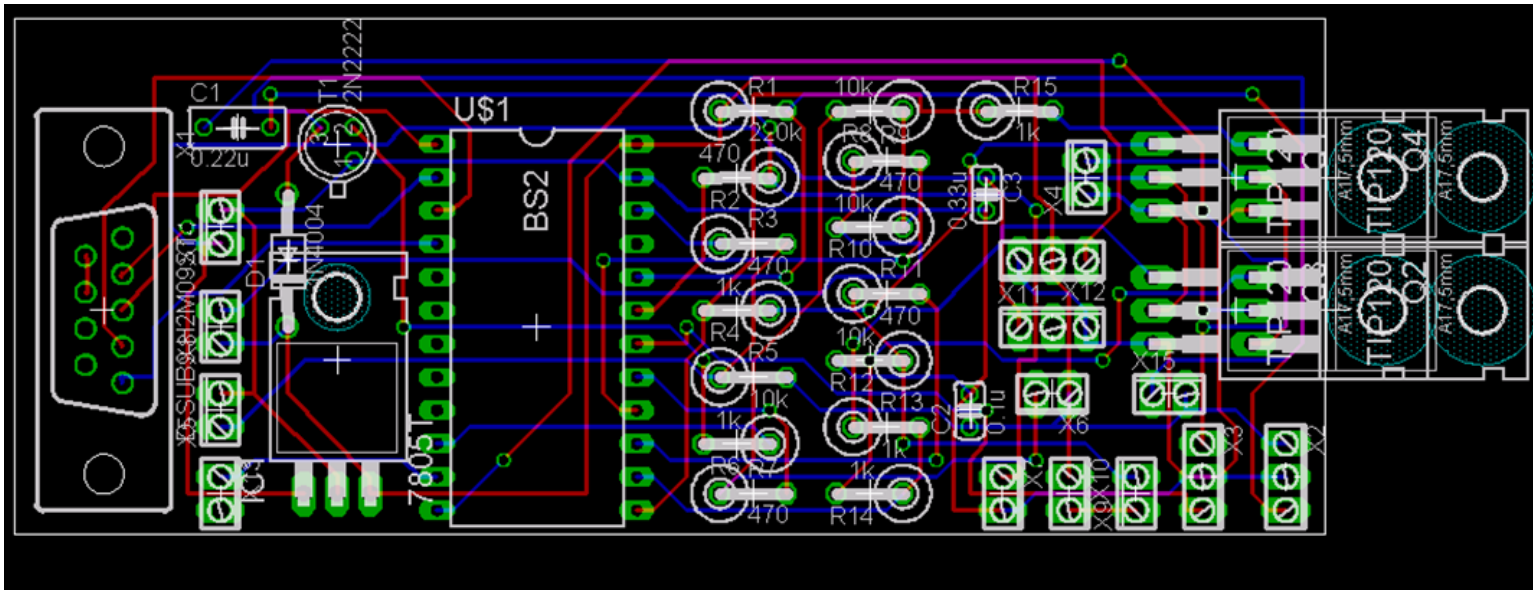
Schematic 9 – Touch Sensor for Stabilizer Arms



Schematic 10 – H-Bridge Design for Drive Motor

Schematics

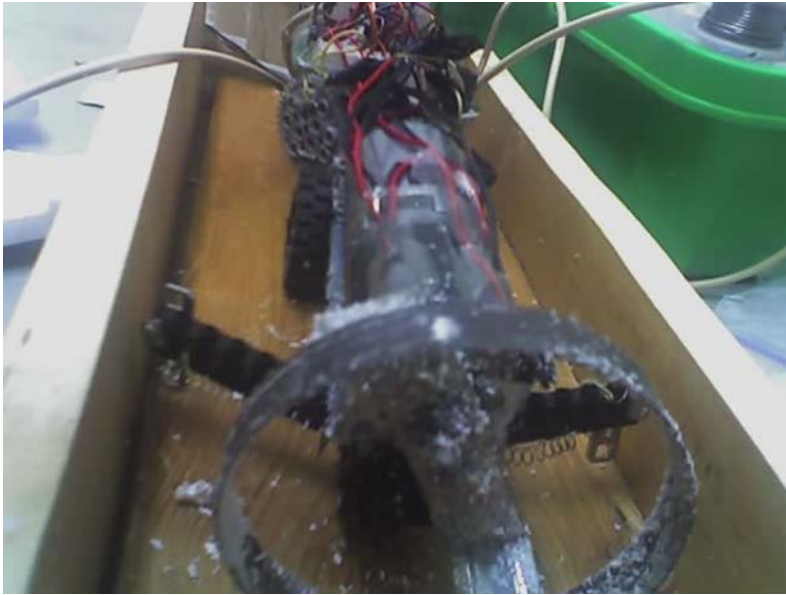
- Board for Mass production
- Actual size is 10 cm by 4 cm



Cost Analysis

| Product | Quantity | Price (\$) |
|-------------------------|-------------|-----------------------|
| Drill Motor | 1 | 25 |
| Lego Motor | 1 | 15 |
| BS2 Kit | 1 | 100 |
| Hall-effect sensor | 1 | 1 |
| Thermocouple | 1 | Included with BS2 Kit |
| Ultrasonic Range Sensor | 1 | 30 |
| DC Motor control | 1 | 30 |
| LCD Display | 1 | 30 |
| Servo Motor | 1 | Included with BS2 Kit |
| Blade (for drill bit) | 1 | 15 |
| Chassis | | 10 |
| Misc. | | 30 |
| | | |
| | Total Cost: | 286 |

[Examples of function]



[Examples of function]



[Mass Production]

- Based on 100 units
- Prices based on wholesale and buying in bulk

| Product | Quantity | Price (\$) |
|-------------------------|-------------|------------|
| Drill Motor | 1 | 10 |
| Lego Motor | 1 | 5 |
| BS2 | 1 | 40 |
| Hall-effect sensor | 1 | 1 |
| Thermocouple | 1 | 2 |
| Ultrasonic Range Sensor | 1 | 20 |
| DC Motor control | 1 | 15 |
| LCD Display | 1 | 20 |
| Servo Motor | 1 | 5 |
| Blade (for drill bit) | 1 | 20 |
| Chassis | | 4 |
| Misc. | | 10 |
| | | |
| | Total Cost: | 152 |

[Advantages]

- Easier to route wire
- Reduced cost and labor
- Minimized damage to finished walls

[Disadvantages]

- Leaves debris behind wall
- Remains along the floor
- Need to check if cable is already there

[Conclusion]

- Wire routing tool
 - Cost efficient
 - Makes renovations easier

- Considerations
 - Lowers home improvement costs
 - Less damage than traditional method
 - Though it has some disadvantages, it has many advantages as discussed

- Future Improvements
 - Upgrade of tool including bit and drill motor
 - This is doable with proper resources
 - Mass production model would include

[References]

- ME 3483: Mechatronics Course website:
- https://my.poly.edu/webapps/portal/frameset.jsp?tab=courses&url=/bin/common/course.pl?course_id=18912_1
- ME 3483: Mechatronics Course Lectures – for an understanding of the theory involved in many of the electronics parts
- Online: www.Parallax.com – for specs and information on parts used
- Online: www.jameco.com – for specs and information on parts used
- Online: www.wikipedia.org – for research and information
- Online: www.catsoft.de – schematic drawing software