Autonomous Geological Sample Retriever Rover

“Mission to Mars”

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Special Thanks to Joe Datillo and the CSU-Pueblo staff
http://www.virtuabotix.com/
ACCOMPLISHMENTS

• MACHINED ALL MECHANICAL PARTS
• SOME PROGRAMMING USING ARDUINO
• BUILD MOTOR CONTROLLERS
• MOUNT LINEAR ACTUATOR
• MOUNT AUGER SYSTEM
WHAT IS A ROVER?

• DEFINITION: A vehicle whose main task is to explore the terrain of a planet where is dangerous for a human due to environment
FUNCTIONAL REQUIREMENTS

• Be completely autonomous
• Should be able to retrieve the desired sample
• Avoid obstacles from the origin to the destination
• Avoid obstacles from the destination to the origin
• Sample should be appropriately stored in “trough” so not to be spilt
PROBLEM

• DESIGN
• BUILD
• TEST
• TROUBLESHOOTING
PRELIMINARY IDEAS

- Use a “claw” to grab and retrieve the soil sample from the ground
- Use a cylindrical punch to extract the sample
- Use a “scoop” to retrieve the sample
IDEA CHOSEN

• USE AN AUGER SYSTEM AND A LINEAR ACTUATOR TO SUCCESSFULLY RETRIEVE A GEOLOGICAL SAMPLE AND THE USE OF JUST ONE PROXIMITY SENSOR

WHY?

• PROGRAMMING
• MACHINING
• USE OF JUST TWO MOTOR CONTROLLERS
MECHANICAL ASPECTS

• TWO SETS OF MOTORS

• LINEAR ACTUATOR
MECHANICAL ASPECTS CTD.

- CHASSIS MANUFACTURED FROM A FLAT METAL SHEET
- AUGER SYSTEM
ELECTRICAL COMPONENTS

• GPS DATA RECEIVER

• SERVO MOTOR

• PROXIMITY SENSOR
ELECTRICAL COMPONENTS CTD.

- ARDUINO MEGA
- ARDUINO ENVIRONMENT
ELECTRICAL COMPONENTS CTD.

MOTOR CONTROLLERS
(2)
# Assumptions and Limitations

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Limitations</th>
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<tbody>
<tr>
<td>The auger should be able to penetrate the surface of the desired area.</td>
<td>The area chose to penetrate should be soft enough to allow the auger system to penetrate.</td>
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<tr>
<td>The rover will be heavy enough to overcome the force applied on the surface by the linear actuator.</td>
<td>The materials used should be light, durable and weather resistance.</td>
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<td>The data collected by the GPS will be accurate.</td>
<td>The rover cannot be touched after the program has started.</td>
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<tr>
<td>The area chose to get our geological sample will consist of non-solids samples.</td>
<td>Not able to retrieve solid samples.</td>
</tr>
<tr>
<td>PART</td>
<td>COST</td>
</tr>
<tr>
<td>---------------------</td>
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<tr>
<td>LINEAR ACTUATOR</td>
<td>130</td>
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<tr>
<td>SENSORS</td>
<td>60</td>
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<tr>
<td>ARDUINO</td>
<td>70</td>
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<tr>
<td>MISCELLANEOUS</td>
<td>200</td>
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<tr>
<td>MOTORS (5)</td>
<td>150</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>610</strong></td>
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ANY QUESTIONS?