

# Design of a Reconfigurable Robot with Lego

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## Motivation

- Modern robots, require flexibility and reconfigurability to meet the versatile demands of industry.
- Large downfall of automation is the inability to accommodate flexible usage.
- Key feature of Lego bricks is considerable reconfigurability.

## Objectives

- Primary objective of the research is to find ways to use the versatility of Lego to design concepts of a mobile robot.
- Research also seeks to improve existing designs to increase functionality by making them reconfigurable.
- Achieve a viable concept which satisfies the identified requirements.

## Methodology

Step 1

- Identify and analyze the user requirements and process capabilities of the model.
- Convert these needs into design features.

Step 2

- Develop three different concepts using the Lego Digital Designer software (LDD).
- Create an outline of the assembly procedure.

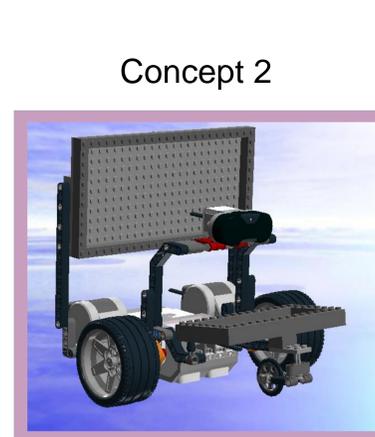
Step 3

- Define criteria for the selection of a feasible concept.
- Compare concepts and select working design using decision matrix.

## Research Progress



Concept 1  
Figure 1. First concept, Kevin



Concept 2  
Figure 2. Second concept, Andrew



Concept 3  
Figure 3. Third concept, Dan

### Decision-Making Stage

Criteria	Number of Parts	Movement Capability	Transportation Capability	Easy to Assemble	Reconfigurability	Total
Weight (Relative Importance)	0	3	4	3	5	Possible Points: 75
Concept 1 Score	101	4	2	3.5	2	40.5
Concept 2 Score	138	3	3.5	3	3.5	49.5
Concept 3 Score	113	3	5	4	4.5	<b>63.5</b>

Figure 4. Decision matrix: Relative importance is based on user needs. A score out of 5 is given by the designer for each of the criteria, then multiplied by This amount to assign points.

### Assembly Planning

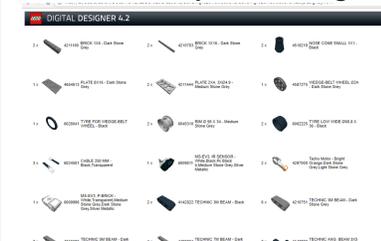


Figure 5. Materials list generated as part of assembly guide in LDD.

### Assembly Progress



Figure 6. Partially assembled model of best concept (Concept 3).

## Future Work

- Following finalization of design, the model should be produced.
- Appropriate programming and control to allow for specified movement.
- Improvements to intelligence will allow the robot to function optimally in its workspace.

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