M2 Task: Find, Recover and Sort

Scenario

A technology demonstrator is required to show the capabilities of a wheeled robot to navigate obstacles, find objects and take decisions quickly and efficiently.

The ultimate objective is to find blocks, determine if they are magnetic and deliver to the correct area based on if they are magnetic or not. The area contains white lines for guidance. Blocks will be positioned on the corners of white lines and in a free space area. Speed bump obstacles are blocking the entrances to the delivery areas.

Deliverables

	Week 1					Week 2					Week 3					Week 4					Week 5		
	T	F	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F	M
Peer Assessment																							
Competition																							
Mentor Meeting																							
Documentation																							

Description	**Deadline**	**Time**
Peer Assessment 1	14/11/2023	9am
First Competition	23/11/2023	9-11am
Final Presentation	28/11/2023	9-11am
Final Competition	29/11/2023	2-4pm
Technical documentation (drawings, schematics, software doc and code)	04/12/2023	4pm
Peer Assessment 2	04/12/2023	4pm

Standard Specification

- The robot must not have any sharp edges and must be safe around humans.
- The robot must display a flashing blue light (2Hz±10%) when (and only when) it is moving.
- The robot must be of modular construction and use standard components where possible to allow easy maintenance and repair in the field e.g. access to exchange motors, modules have plugs/sockets, fixings accessible
- The robot must have the red and green indicator LEDs clearly visible and installed on the top of the build.
- The robot must be well constructed i.e. not held together with tape and glue, unsupported/unprotected cables, parts not fixed down
- The robot must be started in a controlled manner by pressing a push button switch or entering a command on the workstation.
- The robot must clearly display the team number in a legible font no smaller than 50mm high.
- All cabling must be neatly installed
- Cable colouring must conform to the site regulations: red power +, black power -, all other colours can be used for signal/control
- A complete set of mechanical drawings and electrical drawings are required of a standard which would allow another engineer to replicate the robot, or carry out repairs
- A software print out and flow chart is required
- Software should be well-structured and well-commented
- The robot must fit entirely in the start/finish area.

The only interaction permitted is between the robot and a workstation. No information may be entered at the terminal or the robot physically handled during a run. The same program must be run after each restart.

Task Specific Specification

- Blocks should be clearly identified before they are transported. This should be indicated by illuminating a red LED for magnetic blocks and a green LED for non-magnetic blocks. The LED should clearly illuminate for >5 seconds while the robot is stationary and installed at the top of the robot.
- Magnetic blocks should be delivered to the red drop off square, non-magnetic blocks should be delivered to the green drop off square.
- The robot may traverse around the table in any manner, it does not have to follow the white lines.
- The robot MUST return to the start/finish block at least once after the delivery of the first block. For points, the robot must be fully inside the lines of the start/finish box and stay there for at least 5 sec. Indicate stop-and-stay by having the blue LED ON constantly for that duration.
- Blocks will be scored for delivery if it deposits the block in the identified drop off square.
- Only a single block may be transported at a time.
- Identifying and depositing blocks from the central free space will be given additional point.

Evaluation

This will be judged upon the following:

- Teamwork and time management
- H&S awareness and application
- Meeting the specification
- Physical testing
- Build quality
- Documentation quality.

Demonstration Task

Teams will be given 5 minutes to complete the task.

Teams must make a sporting attempt to complete the task – if in doubt about what is consider a 'sporting' attempt they should consult with the teaching staff.

Teams may restart their robot as many times as they wish. However, their score will be reset to zero each time and the table reset every time this happens. The timer will not be reset. The run with the highest score will count.

There is no upper limit on the number of blocks transported. 4 blocks will be on the table at the start, additional blocks will be added to the free space if all have been collected.

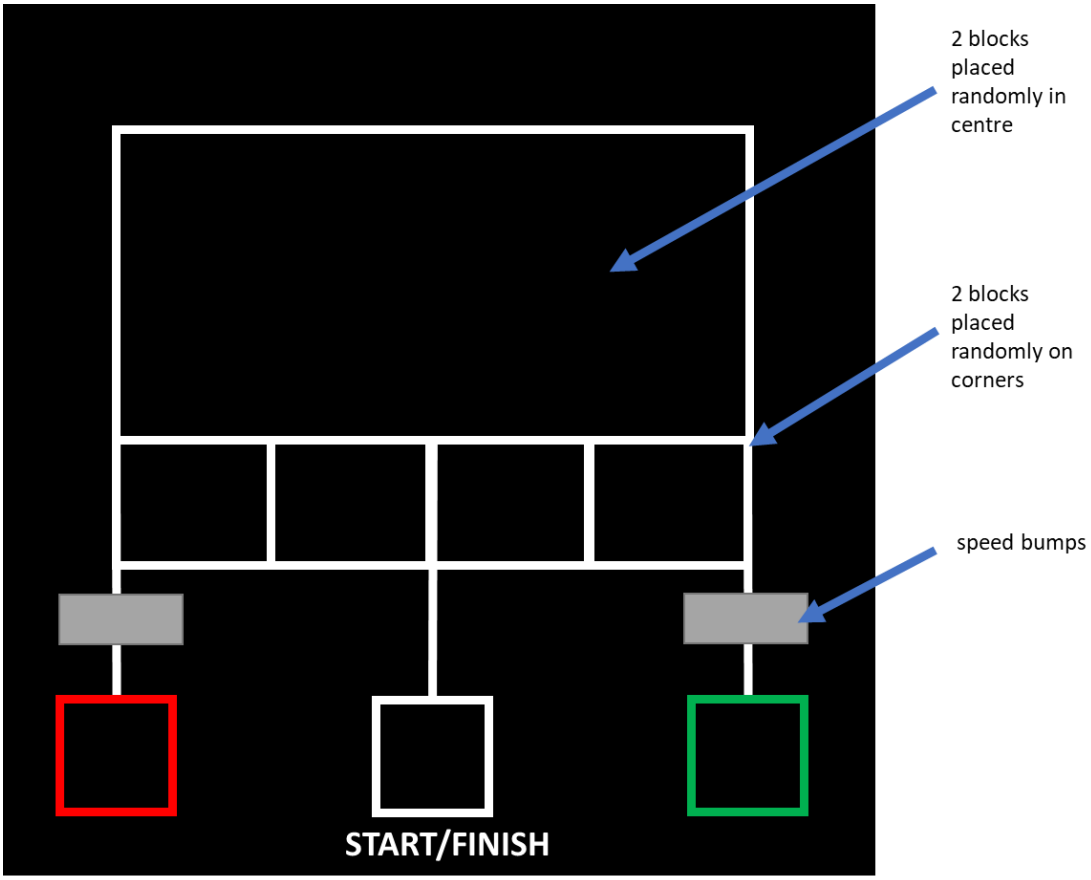
Scoring

The judges decision is final.

Action	**Score**
Robot completely leaving the start box	+5
Correct LED displayed to identify block (per block).	+5
Delivered to identified delivery area (entirely within lines) Block on lines and edges Block in centre (free space)	 +10 (each) +20 (each)
Robot returns to the start/end box and stops for 5 sec such that the robot is entirely within the lines of the box. Indicate the 5 sec stop with the blue LED being ON constantly for the 5 sec duration. ***The robot must have made a sporting attempt to identify and collect blocks.***	+10

Table Layout

Not to scale.



2 blocks will be placed randomly on corners of the grid, 2 blocks will be placed randomly within the centre of the field. If all 4 blocks have been collected, additional blocks will be placed one at a time randomly in the centre of the field. Blocks will continue to be placed until 5 mins is up or the robot returns to the start/finish area.

Photo of blocks (block may be different colour), dimensions 38mm square +/-2mm: