

Embedded Systems 2010/11. Assignment 2

tjw 28.12.10

Derbot Challenge: Provisional Task Statement

In your team, design and build a Derbot-based AGV, fitted with a 16F873A microcontroller, which undertakes all or some of the following actions:

The AGV runs on a black unfenced “competition surface” approximately 2.4 m square, similar to the one illustrated below. It follows a white track as fast as possible. At some point along the track a wooden block will be placed, with one face parallel to the track. Opposite this will be placed a receptacle. The Derbot should drop a glass marble into this. There will be a finish zone at the end of the track, with a light source positioned outside it. The Derbot should turn to face this source, finishing with its wheels on the side nearest the light source.

Any revisions or clarifications of competition rules will be communicated on the module Blackboard site.

Track Following

Track width is 17mm approx, white insulating tape laid on flat plywood painted matt black. The AGV must be tolerant of some scuffing/imperfection of surfaces, and variability in track width.

Marble dropping

The Derbot should be loaded with the marble before it starts. The wooden block will be placed approx. 120 mm from the track centre, and with one face parallel to the track. Its approx dimensions will be 150 mm high, 90 mm long (this side parallel to the track), and 38 mm wide. The receptacle will be approx. 133 mm x 80 mm, of height 65 mm. It will be placed with longer side parallel to the track, the side closest to the track will be 95mm from the track centre.

Finish Zone

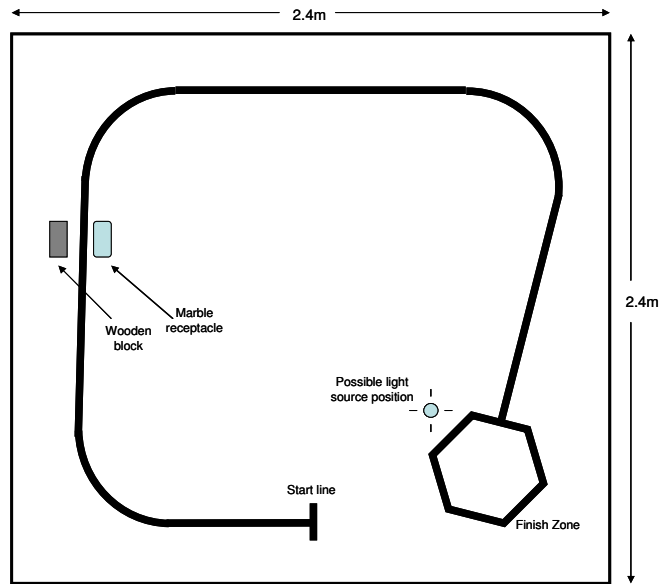
The finish zone will be 6-sided, with one side touching the track and at right angles. Each side will be 200 mm approx. The light will be a diffuse source, equivalent to a 60 W domestic tungsten light bulb, placed outside the finish zone and around 200 mm from the centre of one side. The Derbot should stop with at least one wheel on the side nearest the light source. The light will not be placed beside the side touching the main track.

Competition Conduct

At the start of competition, all AGVs must be placed in the “holding bay”. Teams take their AGV from the holding bay when it is their turn to compete. One team member should give a brief presentation (less than 3 minutes), introducing the team, and indicating the team strategy. The AGV with power switched off should then be placed with wheels on the start line. On the command GO, power should be switched on; there should be no further manual contact with the vehicle. The scoring schedule below then applies. Gross manual intervention leads to forced restart, or disqualification; this includes lifting and relocating the AGV, or pushing and guiding.

The competition judges’ interpretation and ruling will be final in all cases.

Example Track Layout



Scoring

Action	Points
Derbot presented for competition	10
Derbot starts moving down track	10
Drops marble in receptacle	60
OR	
Drops marble within 100mm of receptacle	40
OR	
Drops marble somewhere along track	20
Follows track continuously up to Finish Zone	60
Accurate stop on line facing light (at least one wheel on line)	60
OR	
Inaccurate stop, but facing light	40
OR	
Stop within finish zone (not facing light, at least one point of AGV contact within zone or on surrounding tape)	20
Speed of completion	5(N-P)*
Touches wood block or marble receptacle	-20
Minor manual intervention (AGV "nudged" - not lifted or moved)	-20
Major manual intervention (AGV pushed, or lifted and placed on track at point it left)	-40
Stop and Restart (clock restarted, only allowed once)	-50
Maximum possible score, for 9 teams = 10 + 10 + 60 + 60 + 60 + (5x8)	240

* N = number of competitors, P = position in order of speed. For non-completers, P=N.