Embedded Systems 2016-17

tjw rev. 6.10.16

Derbot Challenge Task Statement *DRAFT*

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

The AGV runs on a black unfenced "competition surface" approximately 1.2m x 4.8m, see Figure below. It follows a white track as fast as possible. It is required to collect four golf balls in turn from a pickup point, and deposit them in turn in the drop-off zone. The golf balls may be black or white. White balls should be deposited in the left part of the zone, black balls in the right. Once four balls have been gathered in this way, the AGV should return to the start/finish line, and stop with its wheels on the line, facing the pick-up point.

Any revisions or clarifications to this task statement, or to competition rules, will be communicated on the module Blackboard site.

Track Following and Gateway
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.

Pick-up and Drop-off
As soon as each ball is collected by the AGV, a new one will be put in its place, until four have been removed. The ball may be placed on a washer or similar to stop it rolling away. The AGV must lose physical contact with the golf ball while in the correct part of the drop-off zone. Points are not lost if the ball subsequently rolls away. The drop-off zone has approximate internal dimensions of 200 mm x 400 mm.

Completion
Points are awarded for correct completion, and for overall time taken. To be considered for a "Speed of completion" mark, the AGV will be deemed to have "completed" if it has removed four balls from the pick-up point, and has achieved at least an "inaccurate stop" on the finish line. For any stop to be awarded points, the AGV must be facing the pick-up point.

Competition Conduct
At the start of competition, all AGVs must be placed in the "holding bay". Before the first team competes, a "house robot" will be run along the track, to prove the track can be followed. Teams take their AGV from the holding bay when it is their turn to compete. One team member will be asked to introduce the team. The AGV with power switched off should then be placed with wheels on the start line, facing the pick-up point. On the command GO, power should be switched on; there should be no further manual contact with the vehicle. Once the AGV has started moving, it may exceptionally be redirected by hand, with contact of less than 3 seconds, and a penalty for each such intervention. A team may also request a 10-minute delay and restart (e.g. for emergency repair), again with fixed penalty. Gross manual intervention leads to forced restart, or disqualification; this includes lifting and relocating the AGV, or pushing and guiding.

Build Quality
After the competition, all Derbots are retained by the module tutors. A mark is awarded for build quality.

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

Example Track Layout
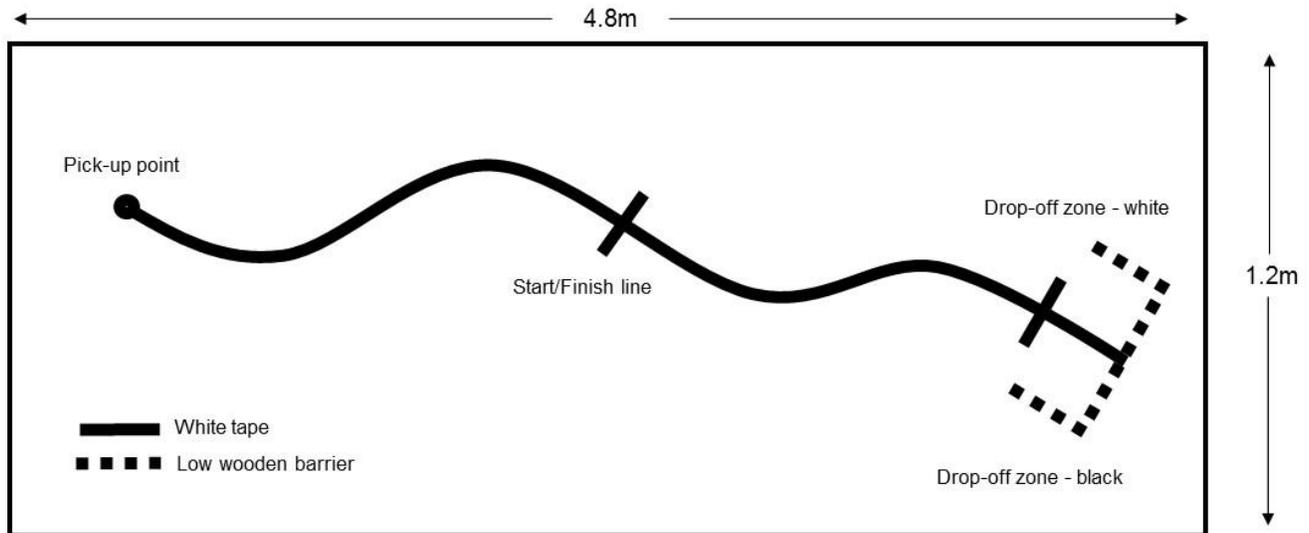
Scoring

Action	Points
Derbot presented for competition	10
Derbot starts moving down track	10
Ball correctly delivered to drop-zone, per ball	20
OR	
Ball delivered to drop-zone, wrong colour	10
OR	
Ball removed from pick-up point, but lost en route.	5
Accurate stop on finish line	60
OR nearly accurate stop on finish line (both wheels within 20 mm of line)	40
OR inaccurate stop on finish line (both wheels within 100 mm of line)	20
Speed of completion	5(N - P)*
Manual intervention (AGV redirected - not lifted or moved)	-20
Stop and Restart (clock restarted, only allowed once)	-50
Example max. possible score, 10 teams, all balls collected and sorted correctly = 10+10+80+60+5(10-1) = 225	

Note: a minimum score of 20 is recorded, if a Derbot is presented and starts moving, however many penalty points may be incurred.

* N = number of competitors,   P = position in order of speed. For non-completers, P=N.
** S = number of obstacles left on competition surface after completion.