Embedded Systems 2013-14. Derbot Challenge: Task Statement

Note: This is the "Final" version of the Task Statement. Any further amendments or clarifications will be posted on the Module Web Site under "Assessments".

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

The AGV runs on a black "competition surface" approximately 2.4 m square. It follows a white track as fast as possible. The AGV starts with both wheels placed on the start line. At an unspecified distance down the track there is an obstacle. The AGV must stop at the obstacle, which is then immediately removed. Further down the track an object, a battery-powered bike light, is placed. This may be switched off, or on, or be flashing. The AGV must identify the lighting mode, and transfer the object to the correct drop zone. When it has done this the AGV must remove itself completely from any drop zone, and come to a complete halt. Completion time is measured to this moment of stopping.

Track Following
Track width is 17 mm 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.

Obstacle
The obstacle is made up of a wood block laid at right angles to the track, of minimum height 10cm, colour unspecified. If the AGV runs into the obstacle and keeps driving forward, the obstacle will be removed, but no points will be scored.

Object
The object is a commonly-available oblong battery-powered led bike light, displaying white light, approximate dimensions 62 mm x 40 mm x30 mm (height from playing surface), and placed so that it is shining upwards. The light may be on, or off, or with all leds flashing on and off.

Drop Zone
The approximate internal dimensions of each drop zone are 25cm square. The object must be left completely within the line defining the correct drop zone.
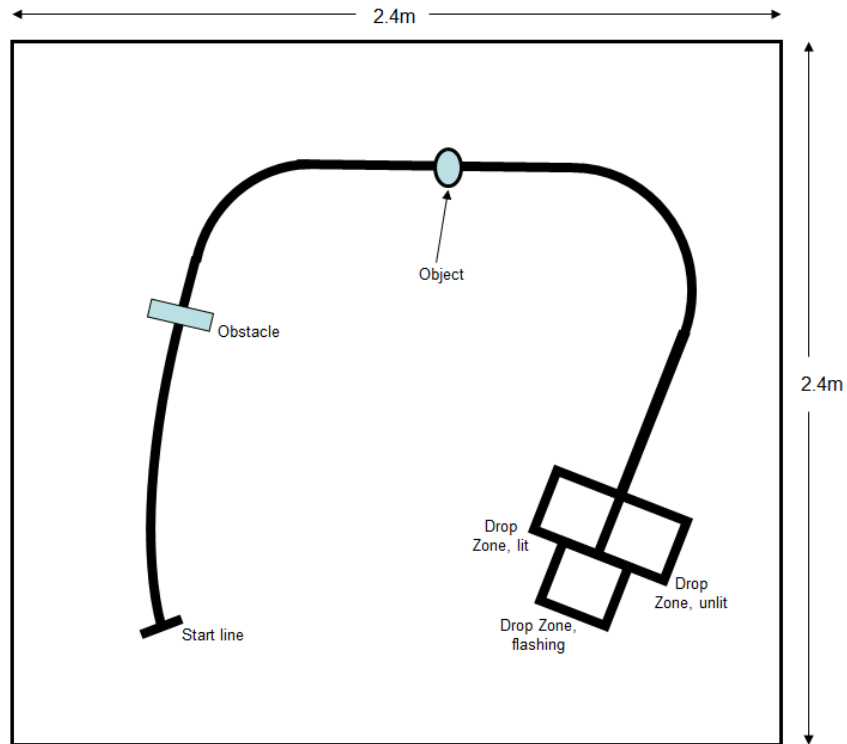
Finish Zone
At the finish, all AGV points of contact with the competition surface must be completely outside the line defining the drop zones. Overhang is permitted.

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 very brief introduction (less than 3 minutes), indicating the team names and strategy. The AGV should then be placed with wheels on the start line. On the command GO, the AGV should be activated (e.g. by switching on power); there should be no further manual or remote control 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. A team will be disqualified if their AGV damages the competition surface (beyond normal wear and tear).

Example Track Layout, and Pallet Dimensions

Scoring

Action	Points
Derbot starts moving on command GO	20
Detects obstacle with contact and stops **OR**	30
Detects obstacle without contact and stops	50
Incorrect and inaccurate delivery of object (mostly in an incorrect drop zone, but touching sides) **OR**	20
Incorrect delivery of object (fully in a drop zone, but the wrong one) **OR**	30
Inaccurate delivery of object (mostly in correct drop zone, but touching sides) **OR**	50
Correct and accurate delivery of object	60
AGV stops with point of contact in a drop zone, having delivered object to satisfy one of 4 above **OR**	20
Accurate AGV stop outside drop zones, having delivered object to satisfy one of 4 above	40
Speed of completion	$5(N+1-P)$*
Manual intervention (AGV redirected - not lifted or moved)	-20
Stop and Restart (clock restarted, only allowed once)	-50
Possible Maximum (for N=12)	**20+50+60+40+60 = 230**

*N = number of competitors, P = position in order of speed. For non-completers, no points are scored.

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

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