

Embedded Systems 08/09. Assignment 2: Provisional Task Statement

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

The AGV starts in a start zone, with both wheels placed on the start line, facing *away* from the main track direction. A number of tracks lead from the start zone, a light is placed in line with one of these. The Derbot must detect the direction of the light and follow that track. The different tracks then merge. At an unspecified distance down the main track there is an obstacle. The AGV must signal that it has detected it, avoid it and return to the track. Further down the track there is a spur to the right. At a distance 100mm down this a lightweight pallet is laid. The AGV must transfer the pallet to the drop zone. The AGV must finally stop in the finish zone. Completion time is measured to this moment of stopping.

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

Light Source and Start Zone

Light will be diffuse source, equivalent to 60W domestic light bulb. Track leading from the start zone have a “V” shaped start (as shown), so an AGV missing the correct track is likely to pick up another.

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. The AGV is allowed to leave the track up to 20cm from the obstacle, and must return within 20cm. Have located the pallet, there is no further obligation to use or follow the track.

Obstacle

The obstacle is made up of a wood block laid at right angles to the track, of minimum height 10cm, colour unspecified. Team should indicate how detection is to be signalled (e.g. by led flash, or sounder).

Pallet

The pallet is made of balsa wood, of dimensions shown, with maximum mass 20g, colour unspecified. It must be taken from the pickup zone, and deposited in the drop zone.

Drop Zone

The approximate internal dimensions of the drop zone are 25cm square. The pallet must be left completely within the line defining the finish zone.

Finish Zone

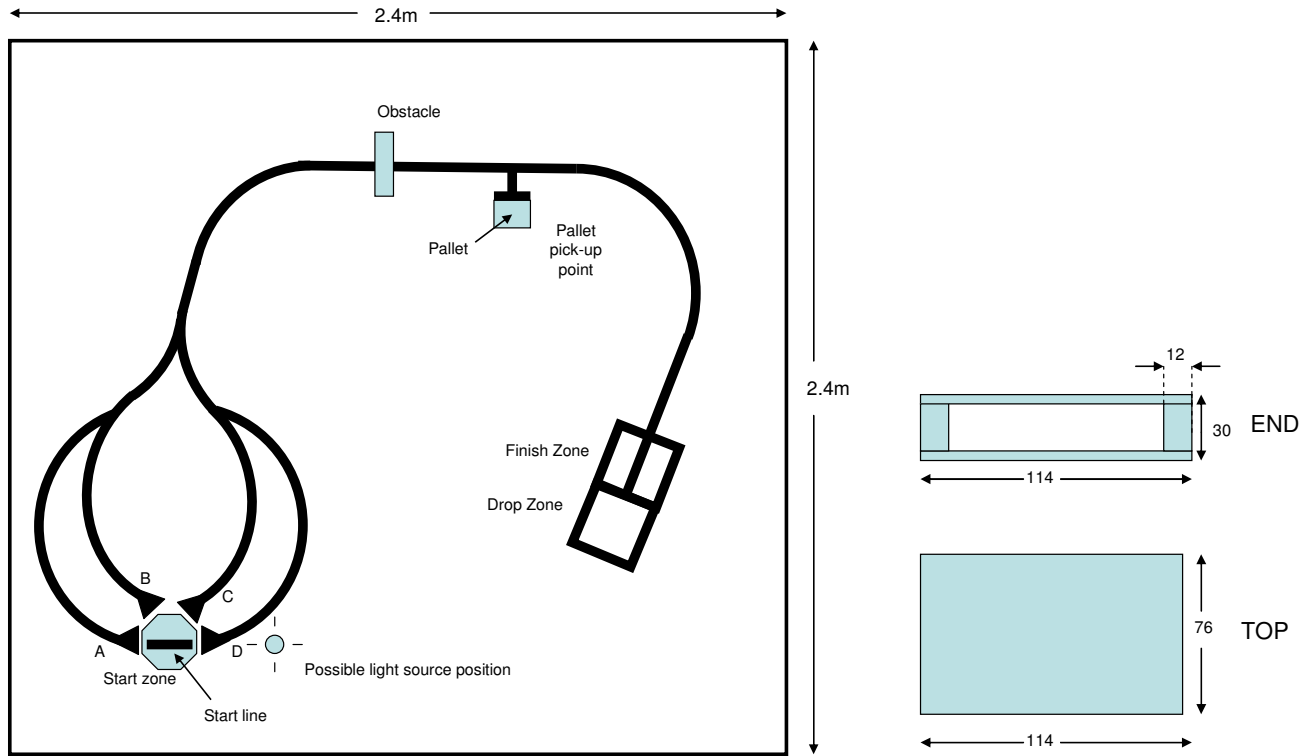
At the finish, all AGV points of contact with the competition surface must be completely within the line defining the finish zone. Approximate internal dimensions of the finish zone are the same as for the drop zone.

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 presentation (less than 3 minutes), indicating the team 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).

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

Example Track Layout, and Pallet Dimensions



Scoring

Action	Points
Derbot starts moving on command GO	20
Identifies and starts on correct track	60
Detects and signals presence of obstacle	20
Avoids obstacle and returns to track	60
Finds pallet and moves it in direction of Drop Zone	OR 20
Inaccurate delivery of pallet (touching side of drop zone, in any way)	OR 40
Accurate delivery of pallet	60
Bonus for continuously <i>lifting</i> pallet in any of above three	40
Accurate stop in Finish Zone	40
Speed of completion	4(N-P)*
Minor infringement, e.g. temporary departure from track	-10
Manual intervention (AGV redirected - not lifted or moved)	-20
Manual removal of obstacle	-30
Collision with obstacle (causing it to move)	-20
Stop and Restart (clock restarted, only allowed once)	-50
Possible Maximum (for N=12)	344

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