ASABE Robotics Competition Challenges

2007

The challenge consisted of an automated harvesting operation using one harvester and one or more unloading carts. An autonomously guided harvester sends wireless messages to indicate that its bin is full. The task of the unloaders is then to engage the harvester, unload it, and return back to a location where they dump their loads into a bin.

2008

This competition had a two-part format: a robotic trial demonstrating the capabilities of small robots designed and built by university students, and a presentation outlining the details of their design. The theme for the trial portion of the competition emulated the operation of a tree harvester. One or two robots developed by the team were placed in the competition area and run autonomously to harvest, gather, and transport as many trees as possible during the time allotted.

2009

The challenge built on the 2008 challenge where vehicles navigated an artificial forest and selectively harvested trees. Guidance lines were provided, and the trees themselves did not have to be transported. One or more vehicles went into the forest and detected if there were trees located at predefined locations on a board. If there was a tree present teams had to communicate the location of that tree to a recording/display device.

2010

The trees were represented by red painted flat-headed rods with a diameter of 1 inch. The height of the trees placed in the 20 holes ranged from 50 mm to 240 mm, in 10 mm increments. The location of the trees was fixed, but the trees were randomly placed in these locations for each team. In other words, there is no correlation between the tree height and its location. The task is to determine the location and height of all 20 trees on the board and to communicate these data wirelessly to a recording device in the least amount of time.

2011

The challenge consisted of developing an autonomous machine that is capable of following a crop edge. The challenge was to optimize the travel speed, while at the same time, guide the machine maintaining a constant distance from the crop edge. The machine also had to leave a bread crumb trail, which consists of dropping visible particulates (in this case ground coffee) that allow the judges to see where the machine went out of bounds.

2012

The challenge centers on automation of cattle feeding in a feedlot. Feedlot operations consist of many pens divided by fences, with roadways providing access to each. Each pen in a feedlot contained a number of cattle that are all at similar stages in growth, approximately the same size, and requiring the same amount of food. However, adjacent pens may contain a different number of cattle, or cattle of a different age or size. As such, each pen required a different feeding regimen.

2013

The challenge came from the hay industry of which Missouri (and Kansas) plays a large part. The theme was to pick up hay bales and stack them in barns. Automation in the hay industry will nearly completely eliminate human interaction with hay and will require robots to make decisions that would otherwise be made by humans operating machinery.

2014

The challenge was to develop a robotic system to simulate installation of a sap pipeline between the maple trees irregularly distributed in a forest.

2015

The competition assignment required the construction of a fully automated robotic system designed to simulate the assessment of soybean plants in a field. The parameters that were assessed included plant color and height. A sample of each phenotype present in the field must be collected and delivered to the reporting station.

2016

The objective required the construction of a fully automated robotic system designed to simulate the transfer of citrus fruits from the harvester to the processing plant. There were two robots required from each team where one hauled the fruits (represented by a ping pong balls) and transferred the fruits to the other robot (trailer), which then moved the fruits to their final destination (processing plant).

2017

The competition challenged teams to simulate a full raspberry primocane suppression and selective floricane removal pruning operation using autonomous robots. Teams were required to develop robots which could identify raspberry primocanes and floricanes, selectively cut irregularly distributed primocanes and floricanes to a given row density, and remove the cut plant material from the rows to clear debris.

2018

The 2018 competition will challenge teams to design and conduct a robot that will autonomously harvest “apples.” The apples (possibly represented by hanging ping-pong balls or holiday ornaments that would have the same diameter as a ping-pong ball) will be in three stages of condition. “Red” will be used to represent apples that are ready for harvesting, “Green” will be used to represent apples that are immature and should NOT be harvested, and “Blue” will represent apples that are rotten or diseased and should be removed from the tree and dropped on the ground.