



e-mail: twheatley@tbaisd.org
phone: 231.995.1304 fax: 231.995.2204
FB: www.facebook.com/TCMTA
Web: <http://www.mta.tc>

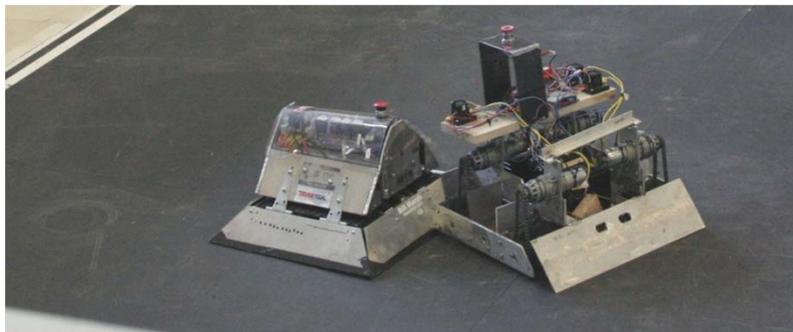


MTA's Robotics Competition Projects

Student Designed/Student Built

Every year since 2000, teams of MTA students led by members of the senior class have designed and built robots that compete in prestigious national robotics competitions. These robotics projects are integrated into the MTA curriculum, fulfilling several academic class requirements. Each team of students performs tasks that are both technical and academic as they design and build their robot, test it in competition, and present it to the public.

MTA students develop the background skills in CAD design, electrical systems, fluid power, manufacturing processes, quality assurance and robotics/automation during their junior year. During their senior year, the students learn to use the Engineering Process to create a complicated robot that will compete in two FIRST Robotics Competition (FRC) District Events in Michigan in March or the National Robotics Challenge in Marion, Ohio in April. **All MTA robots are student designed and student built.**



FAR LEFT: *The MTA 2010 Heavyweight Sumo Robot was fully autonomous. It used four infrared sensors to find the opponent robot. Then the MTA robot advanced upon the opponent and used its angled sides to get under it and push it off of a 16' x 16' mat.*

Over the years, teams of MTA students have brought home numerous awards at the National Robotics Challenge (NRC) and FIRST Robotics Competition (FRC) events. The most prestigious award at the National Robotics Challenge is the **Honda Innovation Award**. Out of the hundreds of robots at the NRC, one robot is nominated for the award from each of the 12 categories of contests. Then, from these 12 nominees, one robot is chosen as the most innovative in design, construction, or programming for the award. More than a dozen MTA-built robots have been nominated for the award over the years, and MTA teams won the award in 2012 and 2014 with the two projects shown below, and again in 2016.

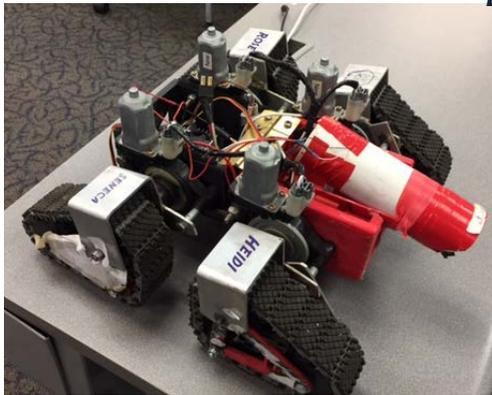


LEFT: *This 2012 Lightweight Sumo Robot deployed a pneumatically-activated suction cup as a defensive strategy. When the robot was in danger of being pushed off of the mat, it pressed the suction cup down against the floor, and a pump removed all the air from the suction cup, making it stick to the mat so no opponent could move the MTA robot. It's innovative design beat out 400 other robots in Ohio for the 2012 Honda Innovation Award.*



LEFT: The **2014 Honda Innovation Award** went to MTA's "Making the memory Melodies" team for its entry in the Automation Robotic Work Cell. The team used MTA's SolidWorks 3D design software and a 3D printer to make "twackers" that would strike partially-filled wine glasses in order to make musical notes and play a simple song and record it on a memory stick. Once the song was played and recorded, the robotic arm would remove the memory stick from the USB drive and place it in a chute

RIGHT: MTA also took first and second places in the 2014 Rescue Robot contest. MTA's first place robot is shown using its 6-wheel-drive system to climb the 45° incline and "rescue" a ping pong ball from the top of the ramp. The long white tube could be rotated forward, and included conveyors that would pull in and store up to 3 balls. An iPhone can be seen positioned on top of the vehicle. It helps the driver locate and "rescue" another ball inside a dark "cave" beneath the ramp.



BELOW LEFT: Last year's Rescue Robot won the **2016 Honda Innovation Award** with its complicated "4-Tread-Drive" system that enabled it to conquer the steep ramp, straddle the 8"-high beam, and crawl through the pea gravel to retrieve ping pong balls.

These projects introduce MTA students to workplace expectations, real-world deadlines, and issues in teamwork and leadership. They also add motivation, meaning, depth of learning (and fun!) to challenging academic subjects. In these integrated projects, students encounter English assignments "disguised" as Gantt Charts, e-mail, text, flip charts, rule summaries, discussion group postings, task lists, budgets, reports, presentations and more to communicate and organize the projects. Designing and building these robots takes several months' worth of work and hundreds of tasks as the students gain consensus on the design, solve structural and logistical problems in order to build, troubleshoot and compete with their robots. Leading such a team requires that students learn to respect and motivate their teammates, and support each other's endeavors

MTA's student culture values intellect, effort, ingenuity and integrity, and collaborating on such a challenging undertaking allows MTA students to build their self confidence and self-esteem the old fashioned way...by taking on difficult challenges and completing them successfully.



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