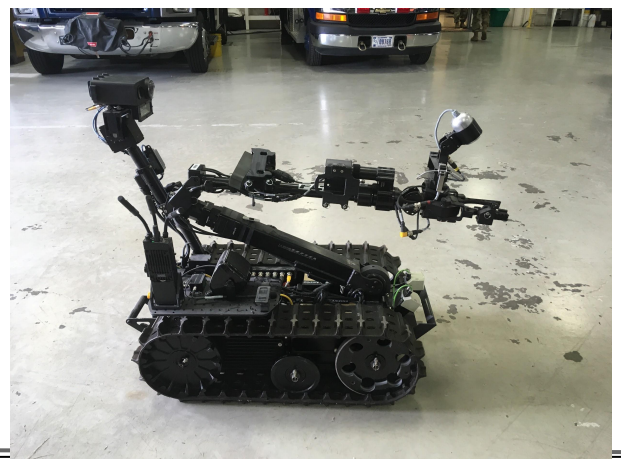
71 CST Robotics and Sensors



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Part I: The Iowa National Guard

Members of the Iowa Army National Guard (IANG) serve both community and country by responding with speed, strength and efficiency to defend American freedoms and ideals at the state, national, and foreign levels. The Iowa Air National Guard (IA ANG) performs five unique missions training and preparing the citizen-airman to respond needs as they arise. Both the IANG and the IA ANG, through the Iowa Adjutant General, are under the jurisdiction of the Governor of Iowa for state emergencies or of the President of the United States in times of crisis.

Part II: Workplace Focus

My Externship consisted of working with members from both branches to create STEM collaboration networks between Iowa Guardsmen and Iowa educators. As a part of this process members of the 71st Civil Support Team and I determined the best ways to incorporate the science and engineering they use with their TALON robot and CBRNE sensor equipment. My lunar robotics students will research the TALON's designs and determine if their placement and or use could better utilize current science and technology to fulfill safety protocols. This will follow iterative design, with multiple testing and re-designs done as a part of the process.

Part III: Introduce the Problem

The 71st CST utilizes an adapted TALON robot for a variety of environments where chemical, biological, radiological, nuclear, or environmental (CBRNE) threats may be found. These could include urban, suburban, industrial, medical, or civil locations, and the robot must be able to adapt to each environment in order to best disable the threat. In order to do so that robots are designed to have parts that are consumable, determined upon what agents they are exposed to (the treads and connectors are rubber and easily removable and replaceable, so if exposed to chemical or nuclear active agents, they can be discarded without disabling the entire robot). With technologies continually adapting and changing, the members of the CST want to be certain thir current designs (body, locomotion, and sensor)are the most efficient and effective use of time and resources for the robot in domestic actions.

Part IV: Background

Students need to have a working knowledge of simple machines and gears, of the periodic table, and forces and motion. Students must become comfortable with rapid prototyping, analyzing data and making alterations based on final desired results, and working in varied team structures toward a common goal.

The 71st CST learned to utilize social media trends to best determine current and future CST threats and how to address them. For example, when the slime craze hit US schools in the mid-2010s, there was an uptick in chemical explosive smuggling and transportion hidden in plain sight as 'slime kits.' Chemical specialists on the CST attended training to specifically address this issue.

While the CST deals with domesitc threats, my students are studying how to mine Helium-3 and thorium on the moon. The use of analytes in chemical sensors, mass spectronomy, inert gas detectors, thermal imaging, and LIDAR allow the TALON robot to cover a wide range of potential CBRNE agents efficiently and effectively in a weapons of mass destruction situation.

Part V: Workplace Solution

The robot's body, locomotion, and senor design are being constantly addressed and adjusted based on agent exposure and domestic environment need. The TALON was originaly designed to keep personnel safe when detecting improvised explosive devices (IEDs). With a domestic protocol for civil support, all aspects of the TALON's design are continally revisited for effective impact. For example, the fish-eye lens camera that reviews and helps map an environment was originally placed on the far 'back' of the robot. In urban environments, the multi-articulate arm needed to be placed farther forward, so when the TALON would travel up or down stairs the arm and camera could be used to balance that end of the robot. This design change occurred after the need for it arose.

The Guard continually looks to iterate an improve their preparedness, and utilizing informaiton and training from all aspects. They want to see what feedback students can provide on how to improve their body, locomotion, and sensor designs, as well as ways to gain information about potential civil support needs through social media or social networking.

Part VI: Educational Pathways

Being a CBRNE specialist requires individualized specialization. While all members of the team are trained in chemical, biological, radiological, nuclear, and environmental agents, but individuals specialize. There are 3 specialists specific to the TALON, 2 others focus on nuclear agents, and 3 others focus on differing aspects of of chemical agents. With the changing domestic security risks and contiuous developments in technology, members of the 71st CST never stop continuing their education. Members work with different units across the country and also with various domestic safety organizations (local police, fire, and or county sheriffs).

Students need to have a passion for their specific area of interest, be precise and intentional in their work, and desire to continue their education. They need to ready and willing to make changes to their procol based on need, rapidly and with surgical precision. Perhaps the most important aspect is teamwork: unless all members can work together with individual precision, the team will not accomplish their overarching goal.