Continued Development on a Mobile Robotic Soccer Platform

Ellis Ratner, 2014

This summer, my research comprised of continuing development on the software that Bowdoin’s Robocup team (the Northern Bites) uses in autonomous, robotic soccer competitions. My work involved a variety of necessary tasks in order to prepare for the Robocup competition, an annual event in which teams from all over the world compete against one another in robotic soccer. The principle goal of the Robocup organization is to promote education and research in robotics and related fields. Bowdoin competes in the Standard Platform League, which means that all competing teams use the same hardware, but each team must develop its own software. Currently, we develop on the Nao humanoid platform, a robot produced by the French robotics company Aldebaran. Our development includes behavioral, motion, vision, communication, and localization systems, as well as other important robotic systems. The robots are design to function autonomously; that is, without the aid of any human controllers while they are playing soccer.

My initial work included improving the system through which the robots on the field communicate with one another, and adding additional framework to monitor the network conditions. In the aftermath of the 2011 Robocup competition in Istanbul, I began to work on long-term improvements to our localization system. Since the beginning of the Northern Bites, the way each robot determined its position on the field (a process known as localization) was through the use of an Extended Kalman Filter, or EKF. More recently, many teams have begun to adopt a particle filter implementation for their localization systems. In many ways, the particle filter is more robust than the EKF for this particular application. Since our competition in Istanbul, Yoni Ackerman and I have worked on developing a Monte Carlo Localization (MCL) system as well as an offline (i.e., no robots involved) simulator in which to test it. The MCL is a particle filter based localization system, which we believe will perform much better than the existing EKF based localization that we have used thus far.

Although we have done critical work on the MCL this summer, all new systems must be tested and tweaked extensively before they can be considered complete (or at least ready for competition.) Future work will comprise of improving the existing framework and implementing further algorithms that could improve the efficiency of the current MCL implementation. Furthermore, within the next year and before Robocup 2012, Aldebaran has pledged to release a new version of the Nao, which will provide us with considerably more processing power. This, in addition to the improved cameras, could lead to a better localization system. The new hardware, however, could also require that we make changes to account for the differences in how the new robots function.

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