The purpose of my work this summer was to create a solid base for the development of a cognitive localization system for soccer-playing robots. RoboCup is a competition in which robots are programmed to autonomously play soccer against another team of robots; since soccer is a complicated and strategic game, this competition provides testing grounds for research in many areas related to robotics, such as motion, computer vision, or cognition. The localization system, one of several core systems in a soccer player program, allows the robots to determine where they are located on the field and thus to navigate accurately. The focus of my long-term project is to develop a localization system that is based on cognitive theory of human localization and navigation; it will rely heavily on visual input and must also interface with the behavioral decisions of the robot. My work this summer laid important groundwork for the future system.

In order to develop such a system, vision information must be efficiently passed to the behavior system. The Northern Bites, Bowdoin College’s team that competes in the Standard Platform League of RoboCup, has developed a vision system written in the C++ programming language and a behavior system written in Python. Passing information between the programming languages, however, is a difficult task that the team had previously accomplished with unnecessarily long and confusing code. Adding new information to the old system for passing C++ vision values to Python would have furthered its many problems, so my work this summer involved creating a new method of connecting the two languages that would be useful for future work on a localization system that needs to interface with both.

For this project, the Boost Python library, one of the many free, peer-reviewed Boost libraries, was used to develop an efficient and user-friendly method of making C++ values accessible in Python. The new Boost Python code is clear and much shorter than its predecessor, which will improve the process of working with it in the future. Furthermore, the new system now provides more visual information to behaviors; while previously only goalpost and ball values were available to Python, behaviors can now access information about field lines, corners, the field edge, and other robots as well. My work has also decreased the amount of processing time required to access C++ values in Python, which is important since the Northern Bites’ game software must run in real time. All in all, these changes have opened up new possibilities for behaviors and have improved the team's C++/Python interface, making it more suitable for further development.

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