Summary: The Robot Soccer domain has become an important artificial intelligence test bench and a widely studied research area. It is a domain with real, dynamic, and uncertain environment, where teams of robots cooperate and face adversarial competition. To build a RoboCup Small Size League (SSL) team able to compete in the world championship requires multidisciplinary research in fields like robotic hardware development, machine learning, multi-robot systems, computer vision, control theory, and mechanics, among others. This paper intends to provide insights about the aspects involved on the development of the RoboFEI RoboCup SSL robot soccer team and to present the contributions produced over its course. Among these contributions, a computer vision system employing an artificial neural network (ANN) to recognize colors, a heuristic algorithm to recognize partially detected objects, an implementation of the known rapidly-exploring random trees (RRT) path planning algorithm with additional rules, enabling the angle of approach of the robot to be controlled, and a layered strategy software system. Experimental results on real robots demonstrate the high performance of the vision system and the efficiency of the RRT algorithm implementation. Some strategy functions are also experimented, with empirical results showing their effectiveness.

Keywords: robotic soccer; computer vision; neural networks; RRT path planning; omnidirectional control