Barcode

RCJ Soccer Simulation Challenge 2021

Mohammad Amin Seyfollahi, Fateme Salimi, Nika Safarpoor, Mohamad Reza Zamani

Technorobiran Institue, Theran, Iran
Mentor of team: Fateme Salimi, Mojde Lotfi
barcodeteamtechnorobiran@gmail.com

Abstract: This study contains explanations about "Robocup 2021 Competitions", in which strategies such as "Goto Point", goalkeeper and shift, software and general results of the competitions are discussed.

Keywords: Python, Webot, Shift, Two-way attack, Goto Point and Number, Goalkeeper Abilities, Direction

1 Introduction:

We're studying at the Technorobiran Institute. This institute was founded by the Yousefi's brothers in 2008. This institute is actively involved in robotics training and competitions. Miss Lotfi is our leader. Fatemeh Salimi is the mentor of the barcode team. Our team members have joined this institute since 2015 and have taught robotics, making a pursuit robot. We started with a simple and advanced script with language (C++). Then we made the football player Light Weight Robot, which was held in presence. But because of to the Corona pandemic, we participated in a competition called (Junior Cup) with a simulator in the language (C++). We have already started learning the language (Python) and working with different simulators to participate in Robocup 2021 competitions. In these competitions, we met different people and formed a group. During this time, we've became more familiar with the characteristics and activities of each person, and team relationships became stronger.

All team members are involved in all areas including programming, idea generation, planning and solution design.

2 Software

In these competitions, we have used the Webot simulator, which consists of different libraries. For example: Service Robot simulator, Educational robot, Assembly lines, etc.

We used a simulator defined for football matches (Robocup). We have this library that we used it for Python language. It was a new and very comfortable language for us. For each team, 3 robots were defined, each of which had two wheels and used them to move on the ground.

Figure 1. Webot

The initial program given to us was very simple and we came up with various ideas to upgrade our robot skills that we performed:

2.1. front shift _ back shift:

We wrote two functions called front shift and back shift. The front shift and back shift functions allow us to

attack from both back and front directions. When the ball is in front of the robot, the front shift function and when the ball is behind the robot, the back shift function is executed. In the front shift function, the robot follows the ball and rotates towards it in any direction where the ball is in front of the robot and follows it. When the ball is behind the robot, the front shift function is not executed and the back shift function is executed. (Figure 2)
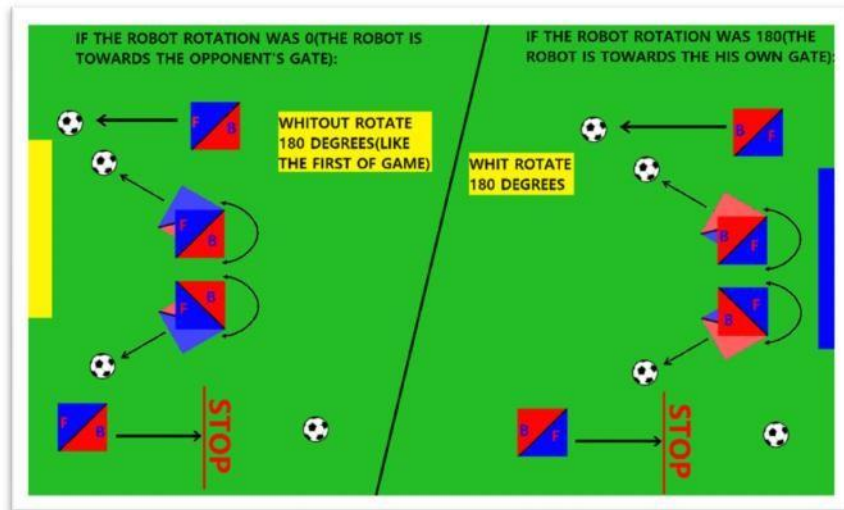

Figure 2. The back/front shift function

2.2. Goto Point:

This function works in such a way that first we give a point to the program and the robot rotates and moves towards that point to reach the desired point (Figure 2)
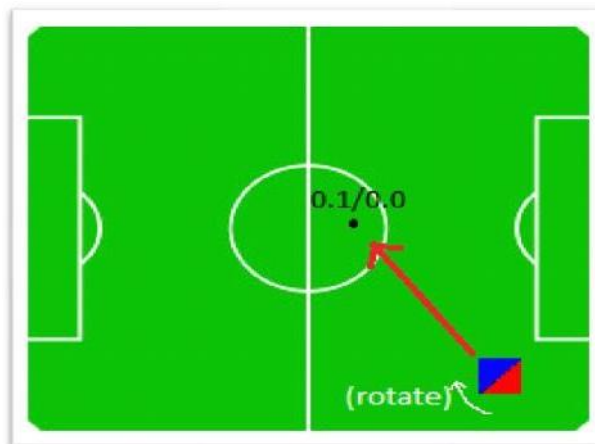

Figure 3. Goto point function working

2.3. Goalkeeper:

The goalkeeper's ability is to get the goal after being in the middle of the field, to rotate and move within a certain range to prevent the ball from entering the goal (Figure 4). If the goalkeeper is out of range, another robot moves towards the goal and replaces it so that the goalkeeper robot is in place.
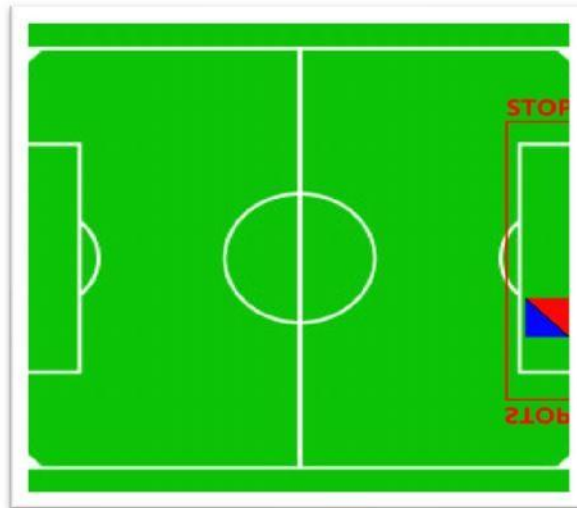

Figure 4. The goalkeeper's zone

2.4. Number:

We wrote a function called "number" that helps identify the distance between our robots by connecting them and recognizing that there are several robots in certain areas (Figure 5).
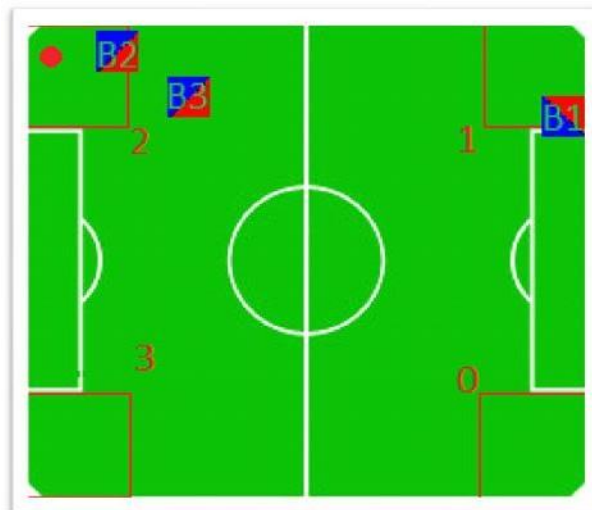

Figure 5. Number function

2.5. Direction:

In the first program, the robot's field of vision was very small, so we had added 9 more ranges to make the robot more accurate (Figure 6).
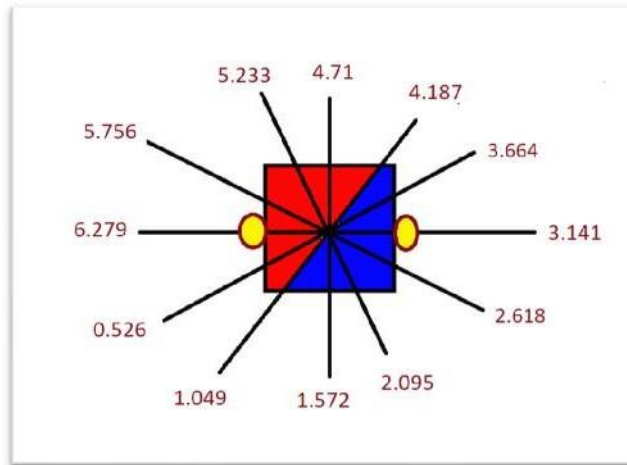
Figure 6. Directions

3 Results:

3.1. Shift: Using the two functions front shift and back shift, we have got the following results:

1) Save time
2) Increase the probability of scoring
3) Decrease the probability of scoring a goal on themselves.

3.2. Goto Point: For using very easy of the abilities of this function everywhere in the program, this function is very efficient in the number function.

3.3. Goalkeeper: These two programs have a great effect on reducing the possibility of scoring goals and increasing the speed of the robot moving along the goal.

3.4. Number: In detecting the position of robots, identifying their number in different ranges, increasing the accuracy of functions and increasing the score.

3.5. Troubleshooting with Goto Point and number: The number function detects the number of robots when they are stuck in a corner, then uses the Goto Point function to send one of the robots to the back of the goalkeeper, to reduce the chance of the opponent robot scoring.

4 Conclusions and Future Work:

While we were working as a team and preparing for competitions, we've gained good experience with Python and working with a professional simulator. Each of us has a different plan for the future, but we are all sure that in the future we're going to build robots (Open Weight) so that we can participate in Iran Open competitions. Most importantly, we learned to work as a team, and as time went on, the relationship between team members became stronger and stronger. We have learned not to be discouraged if we encounter a problem and to keep trying.

5 References:

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