

Robocup2021

Junior soccer simulation

Team name: A.T.S.T

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Abstract. The junior soccer robot just includes software. Junior soccer simulator is designed with webots that is capable of programming with python. After starting webot simulator and running robots program we received program data that includes position of robots, position of the ball and direction of robots. Using this data we programmed our robots and we tried to write different algorithms. We used fastest robot to the ball algorithm for goal keeper. We made a program that moves the goal keeper inside a defined area for getting read of location of the progress and we used another algorithm named headlook that finds where the ball is going to be and moves the goal keeper to that position.

Keywords: Software, Simulator, Webots, Programming, Python, Algorithm

1 Introduction

Robotics is one of the most popular subjects in the world. We started learning robotics and programming from last year in school. We first made junior soccer robots then we heard about robocup simulator league we downloaded the simulator named webots and started learning and using it. Then we learned python for programming the robots in webots. We first made a simple program that just follows the ball and then we added new algorithms like headlook to the program and submitted the code and then we got ready for technical challenges. (figure_1)



Figure_1: team members

2 Software

Robocup junior soccer simulator league is based on software and does not contain any physical part or electronics. It uses a robot and physics simulator named webots and uses python for programming the robots. (figure_2)

```
115 session = requests.Session()
116 session.headers = get_default_headers()
117 # session.cert = certifi.where()
118
119 # b/c this is necessary for persistence...I
120 def __init__(self):
121     super(Manifest, self).__init__()
122
123 @classmethod
124 def modify_session(cls, **kwargs):
125     """Use **kwargs to enter arbitrary k/v pairs
126     session_param_dict = kwargs
127     for param_name, param in session_param_dict.items():
128         try:
129             assert param_name in requests.Session().headers.keys()
130             # this is dangerous as all hell
131             # TODO: Find an elegant way to replace this
132             cls.session.__dict__[param_name] = param
133         except AssertionError as err:
134             print("You've passed in {} as param_name".format(param_name))
135             print("Options are: {}".format(requests.Session().headers.keys()))
136             print("Bypassing {}...".format(param_name))
137             # explicit garbage collection.
138             del session_param_dict[param_name]
139             continue
140
```

Figure_2: software and simulator

3 Webots

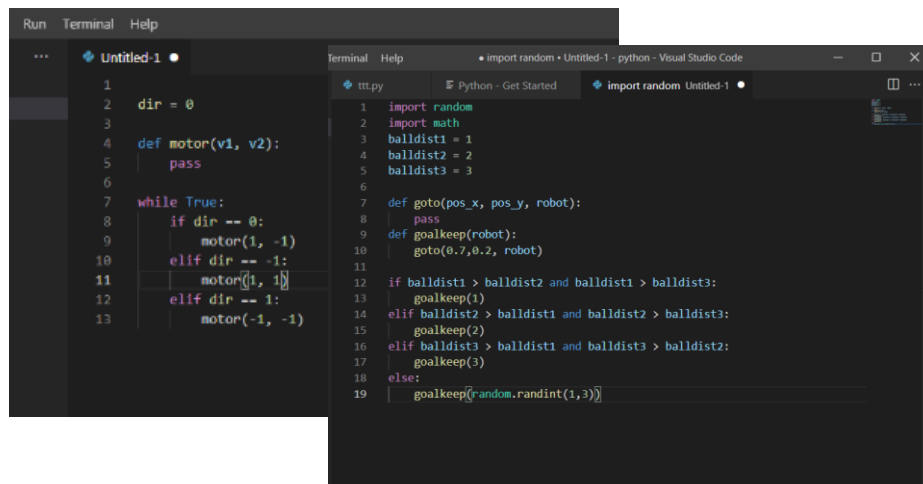
Webots is a platform for making simulators for robots. Robocup jounior soccer simulation leage simulator is made with webots to it made of two teams that each have three robots that can only move with two wheels that limits the movement of the robot to forward and backward but if you want to move the robot in anoather direction you need to first rotate the wheels in aposit directions that tirns the robots the you can move. (figure_3)



Figure_3: software and webot simulator

4 Program

Python is one the worlds most popular programming languages that is used in so many programs and projects. We learned python in last year at school and practiced python a lot in this year. We used python in a lot of projects in pass. We program the robots in webots with python. Webot gives some data to us to use like posions of the robot, posion of the ball and direction of the robot we use that data to control the robots with some algorithms. (figure_4).



Figure_4: software and programming

5 Algorithms

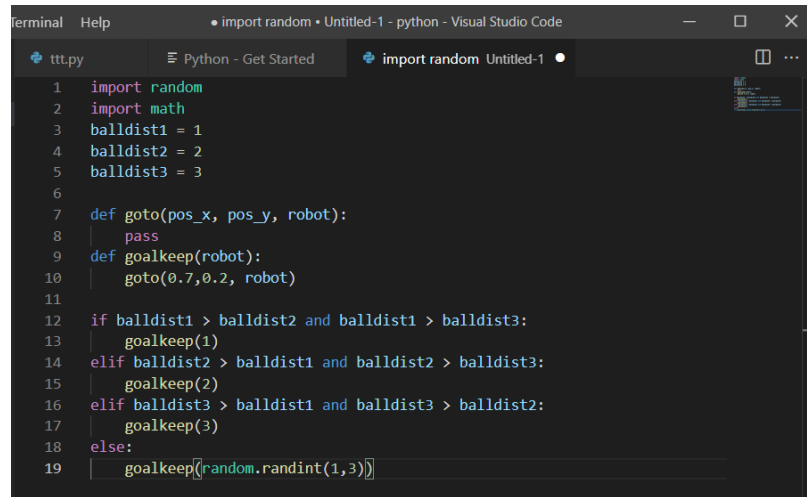
An algorithm is a procedure or formula used for solving a problem. You need to make a lot of algorithms in order to make a program for soccer robots. We used some algorithms in our program to like head look or farthest robot to the ball algorithm. The head look algorithm calculates the vertical position of the ball inside the goal based on two positions of the ball in two different times that calculated with line equations. The farthest robot to the ball algorithm finds the farthest robot to the ball and puts it inside the goal. It finds it using Pythagoras theorem but we use a simple trick to higher performance. We use the square of a number instead of calculating the square root of a number that higher the performance a lot because it does not need to calculate a square root every time. (figure_5)



Figure_5: software and algorithms

6 Farest robot to the ball

With this algorithm we find what is the best robot to put inside the goal. We first find the farest robot to the ball with a simple code and pythagoras theorem. We find the biggest number with some if statements then rotate the robot towards the goal then we move the robot to the goal and straite it. (figure_6)

A screenshot of a Visual Studio Code editor window. The title bar shows 'terminal Help • import random • Untitled-1 - python - Visual Studio Code'. The editor has two tabs: 't1t.py' and 'Python - Get Started'. The active tab 't1t.py' contains the following Python code:

```
1 import random
2 import math
3 balldist1 = 1
4 balldist2 = 2
5 balldist3 = 3
6
7 def goto(pos_x, pos_y, robot):
8     pass
9 def goalkeep(robot):
10     goto(0.7,0.2, robot)
11
12 if balldist1 > balldist2 and balldist1 > balldist3:
13     goalkeep(1)
14 elif balldist2 > balldist1 and balldist2 > balldist3:
15     goalkeep(2)
16 elif balldist3 > balldist1 and balldist3 > balldist2:
17     goalkeep(3)
18 else:
19     goalkeep([random.randint(1,3)])
```

Figure_6: Farest robot to the ball

7 References

- <https://drive.google.com/file/d/1WdsB8ayPtlh3qTKui0jDZdmWI-ShMa8>
- <https://github.com/RoboCupJuniorTC/rcj-soccer-im/archive/refs/heads/master.zip>
- <https://www.python.org/downloads>
- <https://github.com/>
- <https://www.avrfreaks.net>
- <http://www.hpinfotech.ro>