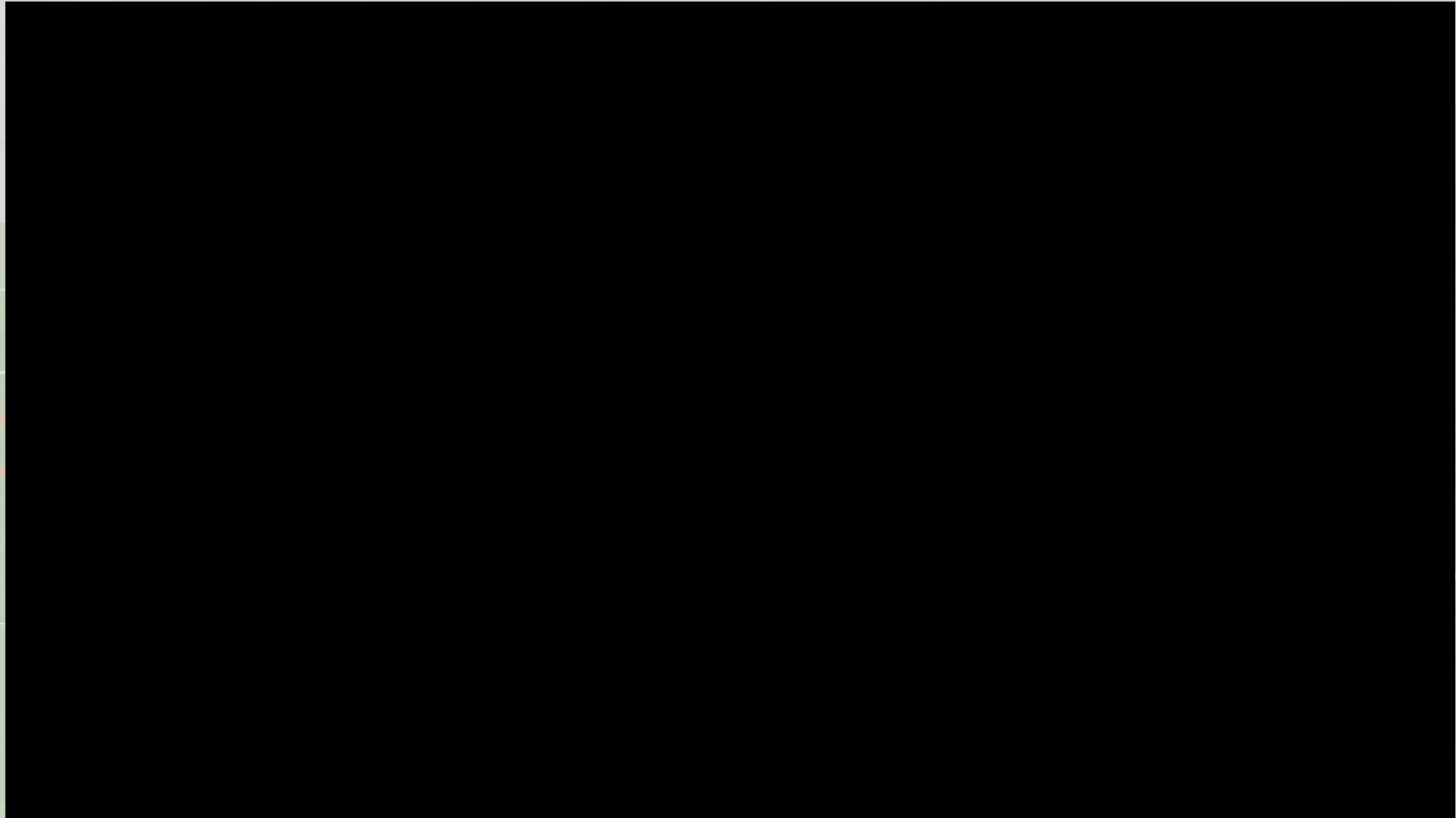

WITS
Robo Cup
TEAM
SCIENTIA
ET
LABORE

RoboCup

- https://www.robocup.org/
- RoboCup is an annual international robotics competition founded in 1996



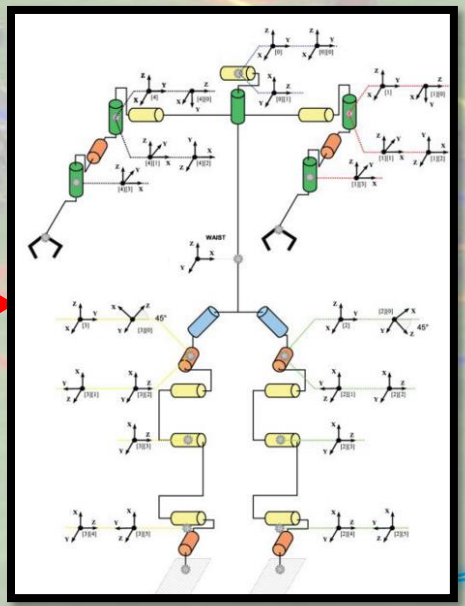
RoboCup

- https://www.robocup.org/
- We work in the 3D simulated League which simulates the NAO robot

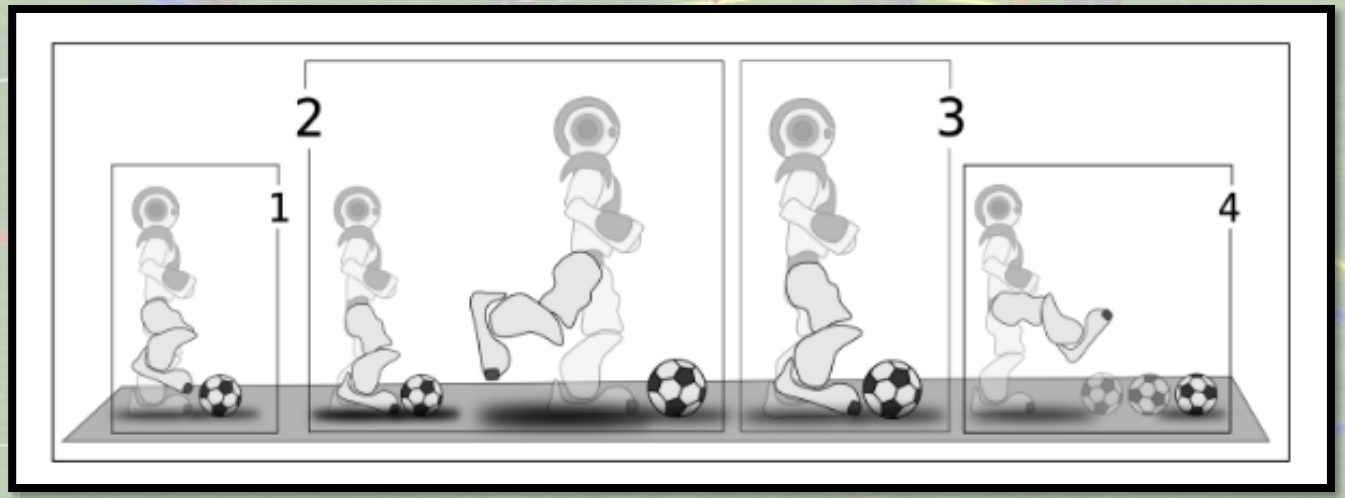

KgpKubs 0:0 WITS-FC 09:31
Playmode: PlayOn
Server Speed: 99%
KgpKubs : 11
WITS-FC : 11

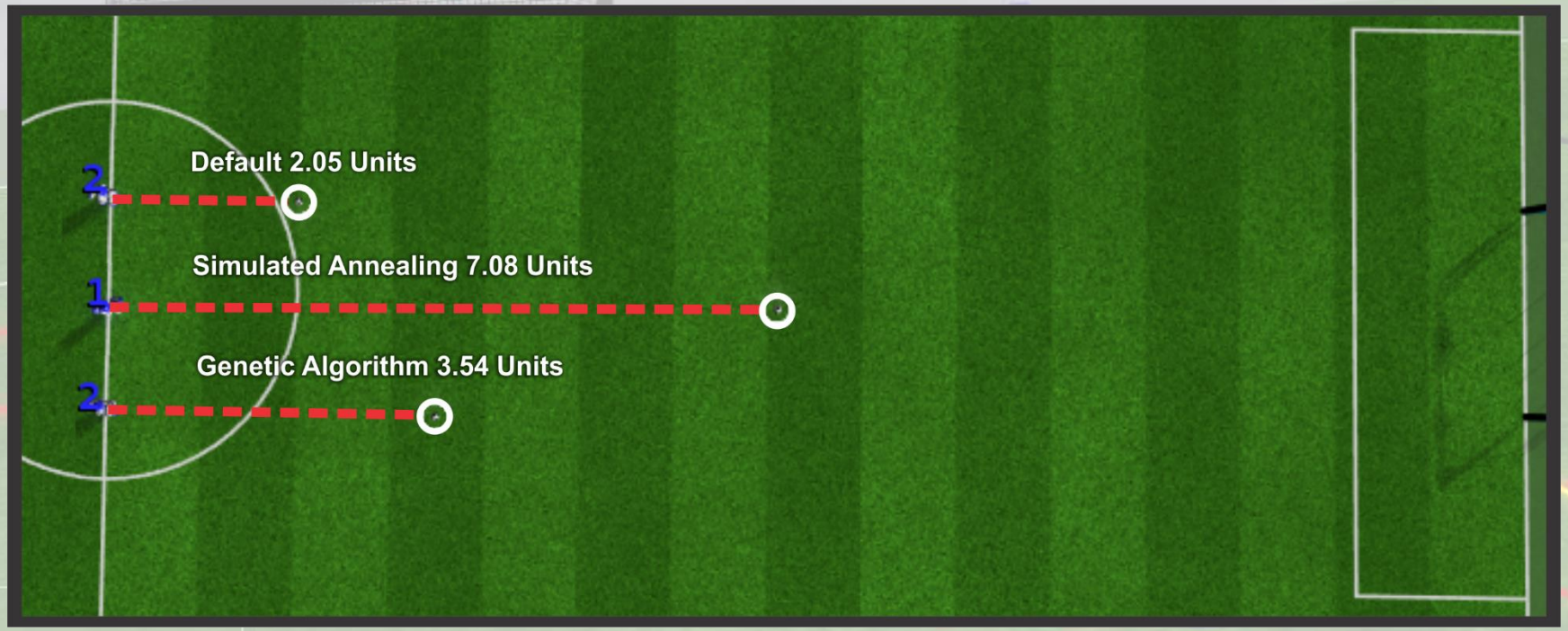
RoboCup

- The simulated model comes with 22 degrees of freedom
- In other words they can fall over in many ways.



Kicking Optimisation




Default 2.05 Units
Simulated Annealing 7.08 Units
Genetic Algorithm 3.54 Units


FCPortugal 0:0 KgpKubs 00:00
Playmode: BeforeKickOff
Server Speed: 73%
11
LIVE

Kicking Optimisation

•kick_ik_0_xoffset	-0.18184725746865413
•kick_ik_0_yoffset	-0.007990019340567048
•kick_ik_0_x0	0.09855534262963274
•kick_ik_0_y0	0.04897226608420107
•kick_ik_0_z0	0.06004895070570849
•kick_ik_0_x1	-0.13267256199213984
•kick_ik_0_y1	0.15055665409986765
•kick_ik_0_z1	0.3048635084962904
•kick_ik_0_x2	-0.075918848350498
•kick_ik_0_y2	0.010843367764323163
•kick_ik_0_z2	-0.03228058151402973
•kick_ik_0_x3	0.3514121512894722
•kick_ik_0_y3	-0.0915098467211551
•kick_ik_0_z3	0.2932735025335922
•kick_ik_0_a0	-2.0713675817098482
•kick_ik_0_b0	4.168030311789961
•kick_ik_0_c0	-0.17712625804502546
•kick_ik_0_a1	-2.3258316746549554
•kick_ik_0_b1	9.39335694003392
•kick_ik_0_c1	-5.4878969788579175
•kick_ik_0_a2	2.254184572289742
•kick_ik_0_b2	0.014404161833793745
•kick_ik_0_c2	-16.34929405684522

•kick_ik_0_a3	-0.1703513663364682
•kick_ik_0_b3	77.12670393386878
•kick_ik_0_c3	-21.212384580007893
•kick_ik_0_wait	0.06679452466769868
•kick_ik_0_scale	2.434596016520202
•kick_ik_0_off3_0	6.8002354818317885
•kick_ik_0_off4_0	23.957167469656504
•kick_ik_0_off5_0	-7.433399813693172
•kick_ik_0_off3_1	-16.624470935986754
•kick_ik_0_off4_1	20.351676522363075
•kick_ik_0_off5_1	-25.63678390762887
•kick_ik_0_off3_2	-50.00201321637502
•kick_ik_0_off4_2	-39.33897746613399
•kick_ik_0_off5_2	54.047464010320134

•kick_ik_0_max_displacement_right	0.025
•kick_ik_0_max_displacement_left	0.025
•kick_ik_0_max_displacement_top	0.025
•kick_ik_0_max_displacement_bottom	0.025
•kick_ik_0_cw_angle_thresh	2
•kick_ik_0_ccw_angle_thresh	2
•kick_ik_0_angle	0

Kicking Optimisation

•kick_ik_0_xoffset	-0.18184725746865413
•kick_ik_0_yoffset	-0.007990019340567048
•kick_ik_0_x0	0.09855534262963274
•kick_ik_0_y0	0.04897226608420107
•kick_ik_0_z0	0.06004895070570849
•kick_ik_0_x1	-0.13267256199213984
•kick_ik_0_y1	0.15055665409986765
•kick_ik_0_z1	0.3048635084962904
•kick_ik_0_x2	-0.075918848350498
•kick_ik_0_y2	0.010843367764323163
•kick_ik_0_z2	-0.03228058151402973
•kick_ik_0_x3	0.3514121512894722
•kick_ik_0_y3	-0.0915098467211551
•kick_ik_0_z3	0.2932735025335922
•kick_ik_0_a0	-2.0713675817098482
•kick_ik_0_b0	4.168030311789961
•kick_ik_0_c0	-0.17712625804502546
•kick_ik_0_a1	-2.3258316746549554
•kick_ik_0_b1	9.39335694003392
•kick_ik_0_c1	-5.4878969788579175
•kick_ik_0_a2	2.254184572289742
•kick_ik_0_b2	0.014404161833793745
•kick_ik_0_c2	-16.34929405684522

•kick_ik_0_a3	-0.1703513663364682
•kick_ik_0_b3	77.12670393386878
•kick_ik_0_c3	-21.212384580007893
•kick_ik_0_wait	0.06679452466769868
•kick_ik_0_scale	2.434596016520202
•kick_ik_0_off3_0	6.8002354818317885
•kick_ik_0_off4_0	23.957167469656504
•kick_ik_0_off5_0	-7.433399813693172
•kick_ik_0_off3_1	-16.624470935986754
•kick_ik_0_off4_1	20.351676522363075
•kick_ik_0_off5_1	-25.63678390762887
•kick_ik_0_off3_2	-50.00201321637502
•kick_ik_0_off4_2	-39.33897746613399
•kick_ik_0_off5_2	54.047464010320134

•kick_ik_0_max_displacement_right	0.025
•kick_ik_0_max_displacement_left	0.025
•kick_ik_0_max_displacement_top	0.025
•kick_ik_0_max_displacement_bottom	0.025
•kick_ik_0_cw_angle_thresh	2
•kick_ik_0_ccw_angle_thresh	2
•kick_ik_0_angle	0

Kicking Optimisation

Given

- A pre-defined parameterised kicking policy.
- A set of 52 hyper-parameters which are used to form the basic kicking policy.
- A simulator which allows you to sample the kicking distance for a given set of parameters.
- The type of robot as well as its physical properties.

Kicking Optimisation

Objective

- To optimise a set of parameters which dictate the performance of a kicking policy to maximise the distance a ball is kicked.

Formation

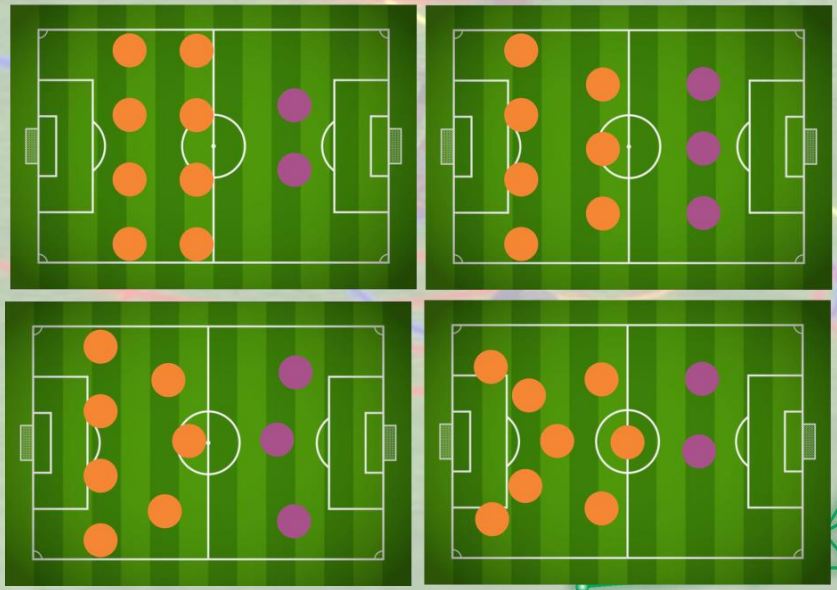
- Soccer is a **multi-agent dynamic environment** which requires **cooperation** between **teammates** to succeed.

STATE			ACTION
Current Formation	Distance Ball to Our Goal	Our Player in Possesion	Select Different Formations
Each Formation encoded as a number	Close, Medium, Far	True, False	Each Formation encoded as a number
1-n Options	3 Options	2 Options	1-n Options

STATE ACTION SPACE

nx3x2xn = 12n

4x3x2x4 = 48



Formation

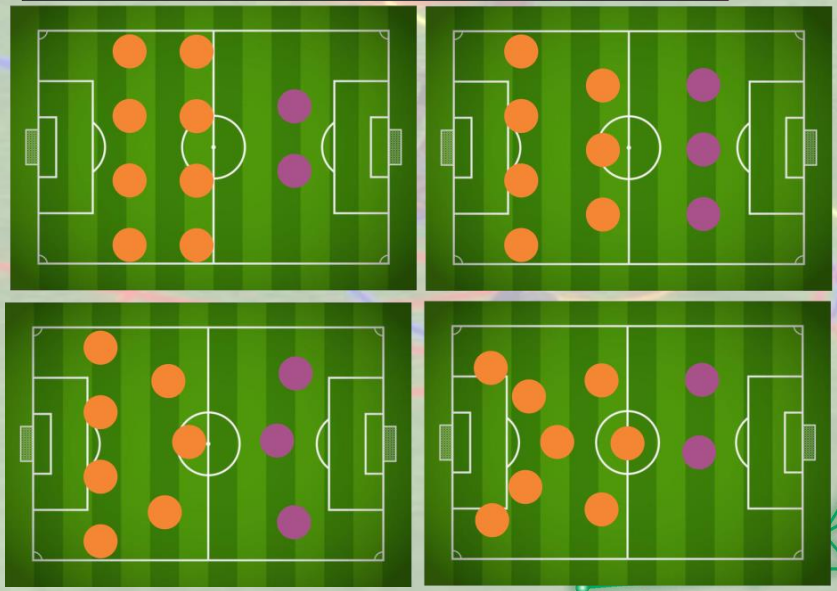
- This involves maintaining a balance between **minimising space** in defence and **maximising** it in offence

STATE		ACTION	
Current Formation	Distance Ball to Our Goal	Our Player in Possesion	Select Different Formations
Each Formation encoded as a number	Close, Medium, Far	True, False	Each Formation encoded as a number
1-n Options	3 Options	2 Options	1-n Options

STATE ACTION SPACE

nx3x2xn = 12n

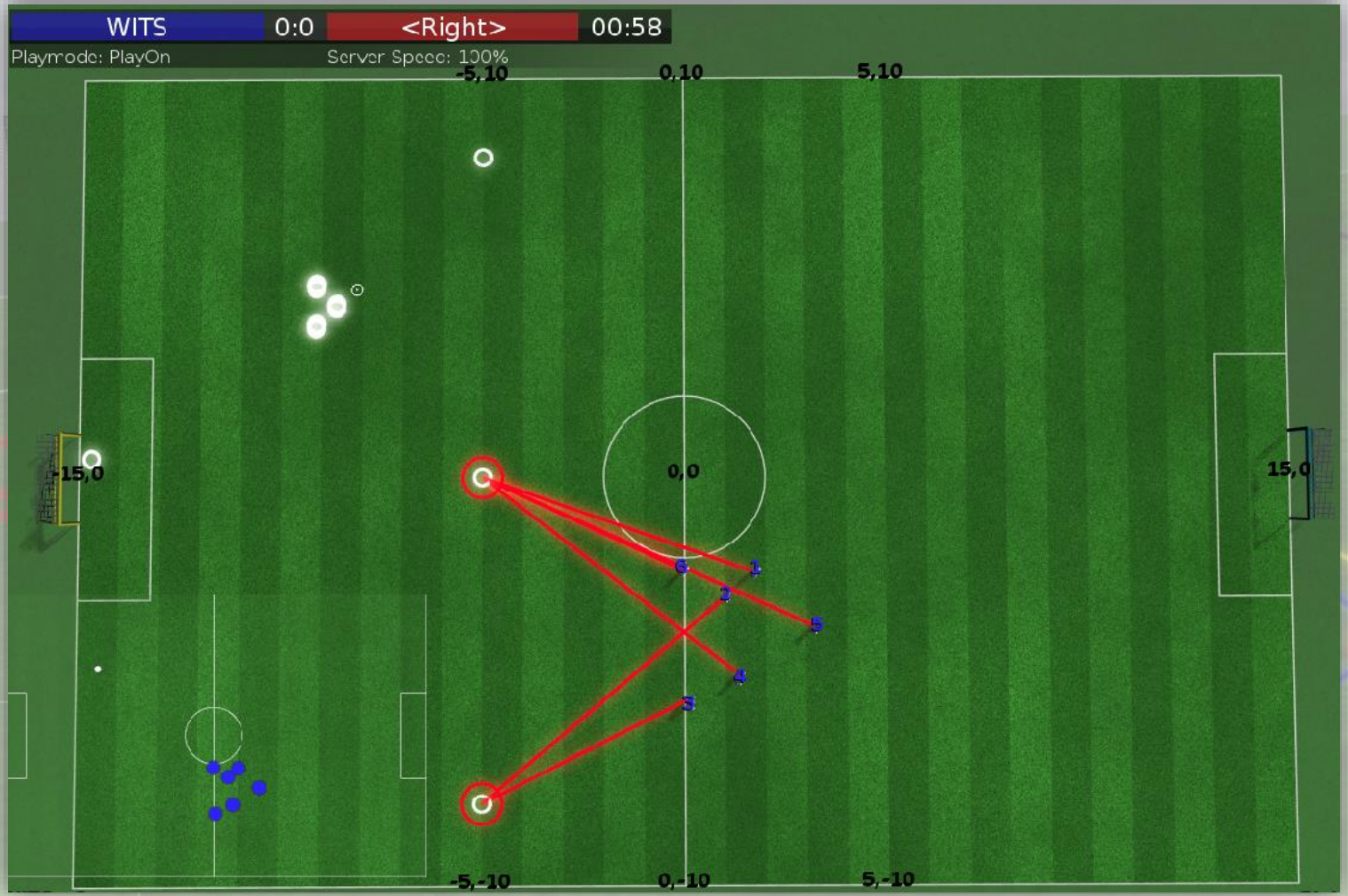
4x3x2x4 = 48



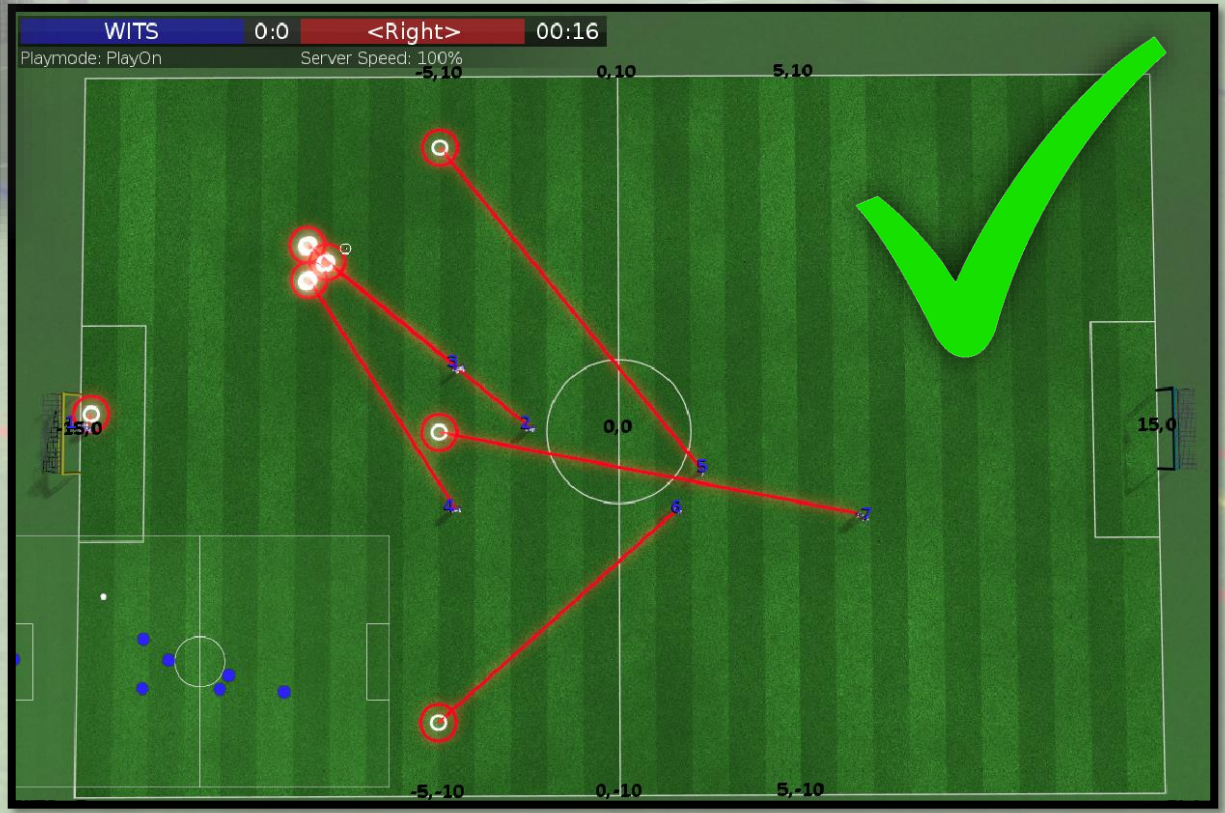
Formation

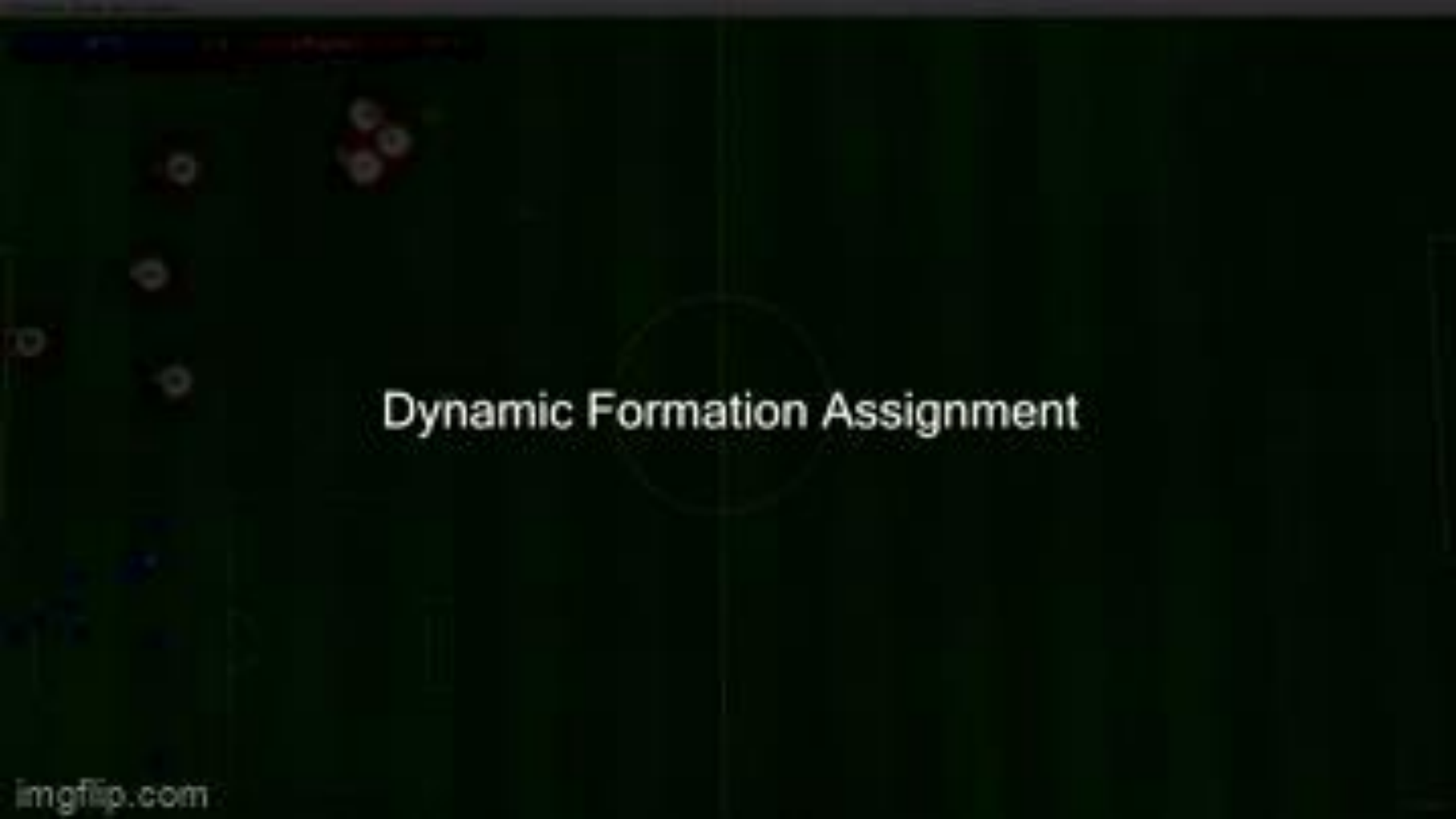
Given

- A set of teammate positions.
- A set of opponent positions.
- The ball position.


WITS
0:0
<Right>
00:58
Playmode: PlayOn
Server Speed: 100%
-5,10
0,10
5,10
-15,0
0,0
15,0
-5,-10
0,-10
5,-10
6
1
2
5
4
3


WITS 0:0 <Right> 00:58
Playmode: PlayOn
Server Speed: 100%
-5,10
0,10
5,10
-15,0
0,0
15,0
-5,-10
0,-10
5,-10


WITS 0:0 <Right> 00:16
Playmode: PlayOn
Server Speed: 100%
-5,10
0,10
5,10
-15,0
0,0
15,0
-5,-10
0,-10
5,-10


Dynamic Formation Assignment
imgflip.com

Why


TUE
0
0
HUM
15:00
POWERED BY
TECH UNITED