ORGANIZING A SOCCER TEAM

An automated approach to find heuristic-based solutions for defensive positioning of soccer players.

MPE – ProDEI – Tiago Mendes-Neves – up201406104@fe.up.pt

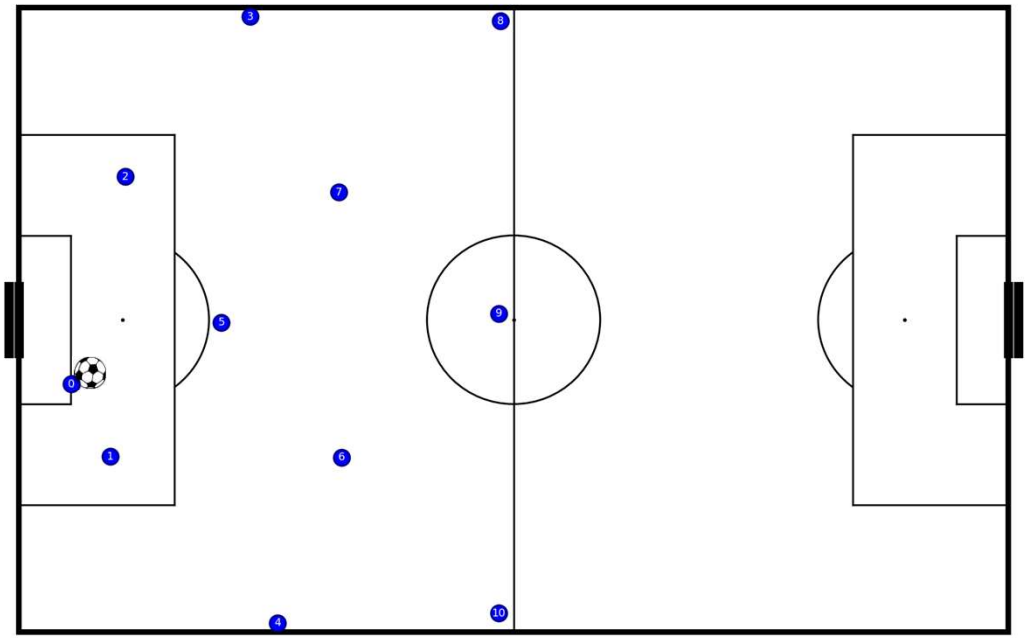
Motivation

Preparation of a soccer game has a very extensive checklist.

- Defensive positioning in certain game situations is one item.

Can AI (Optimization algorithms) help in this regard?

No	Authors	Title	Year	Source title	Cited by	DOI	Algorithms	Approach
1	Laureano, M.A.P., Tonidandel, F.	Performing and blocking passes in small size league	2019	Proceedings - 2019 Latin American Robotics Symposium, 2019 Brazilian Symposium on Robotics and 2019 Workshop on Robotics in Education, LARS/SBR/WRE 2019		10.1109/LARS-SBR-WRE48964.2019.00012	Particle Swarm Optimization	RoboCup; Set Pieces positioning; Blocking pass lines only
2	Larik, A., Haider, S.	A framework based on evolutionary algorithm for strategy optimization in robot soccer	2019	Soft Computing	3	10.1007/s00500-018-3376-6	Genetic Algorithms	RoboCup; General positioning; Goal difference, regions occupied and ball possession
3	Laureano, M.A.P., Tonidandel, F.	Analysis of the PSO Parameters for a Robots Positioning System in SSL	2019	Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)	1	10.1007/978-3-030-35699-6_10	Particle Swarm Optimization	RoboCup; General positioning; Minimizing distance, block the view of the opposing robot to a point of interest, block the view of the goal, (respect SSL rules)
4	Agarwalla, A., Jain, A.K., Manohar, K.V., Saxena, A.T.	Bayesian optimisation with prior reuse for motion planning in robot soccer	2018	ACM International Conference Proceeding Series	2	10.1145/3152494.3152502	Bayesian optimisation	-
5	Henn, T., Henrio, J., Nakashima, T.	Optimizing player's formations for corner-kick situations in RoboCup soccer 2D simulation	2017	Artificial Life and Robotics	1	10.1007/s10015-017-0364-3	Firefly algorithm	RoboCup; Corner kick; Simulation
6	Larik, A.S., Haider, S.	On using evolutionary computation approach for strategy optimization in robot soccer	2016	2016 2nd International Conference on Robotics and Artificial Intelligence, ICRAI 2016	2	10.1109/ICRAI.2016.7791220	Genetic Algorithms	See 2.



Problem definition

- 11 opposition players
  - Dependent on the use case
  - E.g., Goal kick

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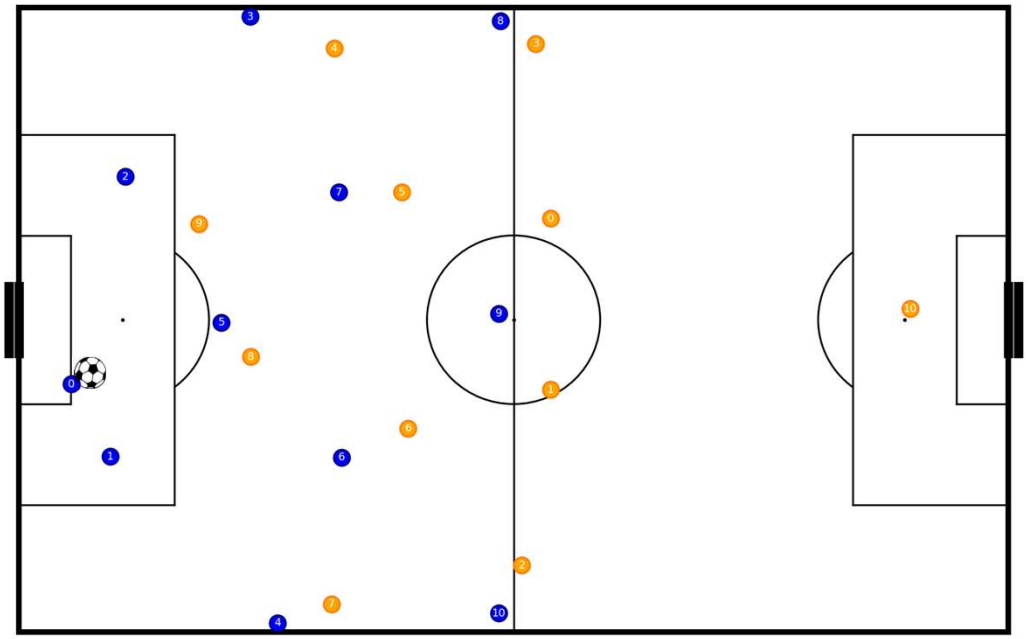

Problem definition

- 11 opposition players
  - Dependent on the use case
  - E.g., Goal kick
- We want to position 11 defensive players
  - 11 (x,y) tupples

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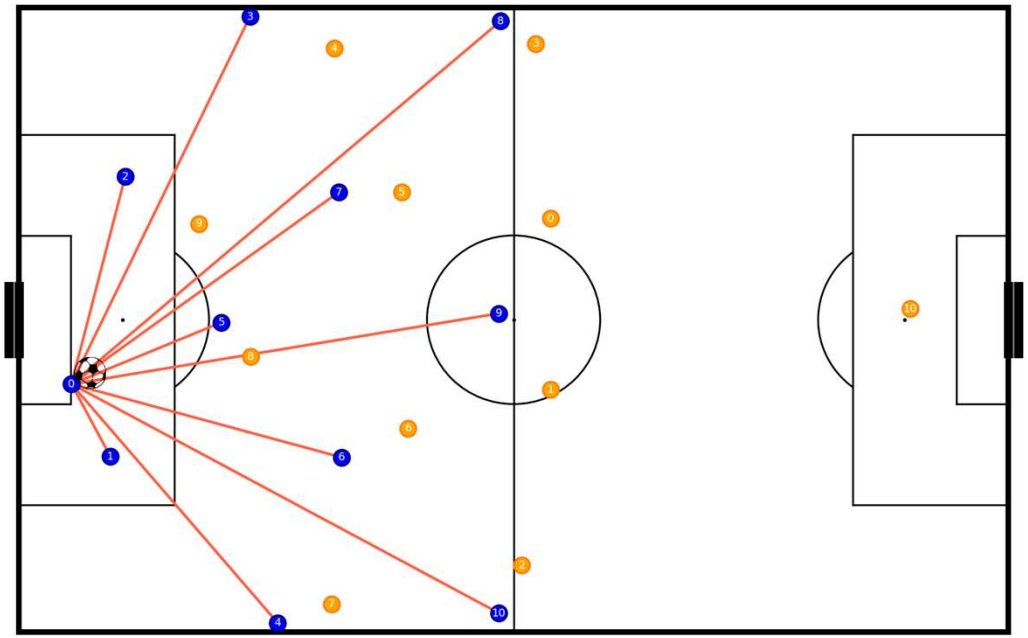
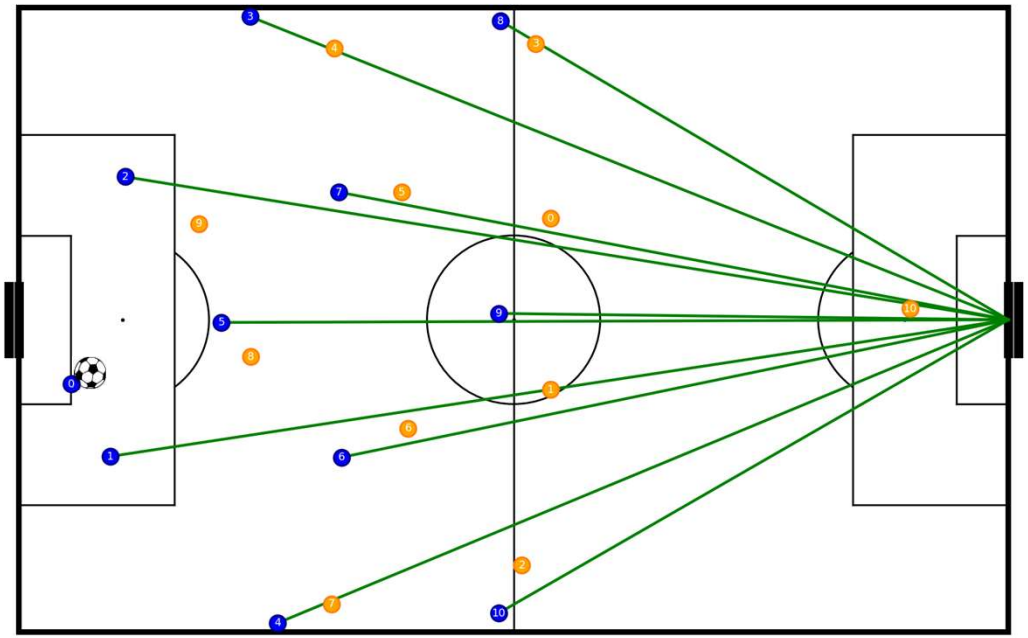


Criteria 1

- Maximize coverage of pass lines

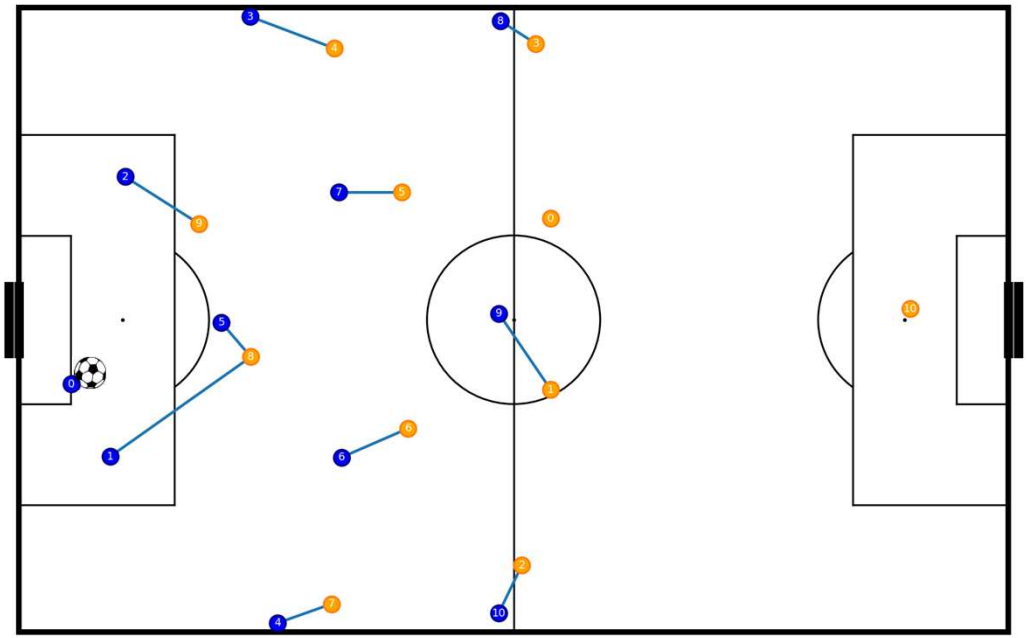
Tiago Mendes-Neves – up201406104@fe.up.pt



Criteria 2

- Maximize coverage of pass lines
- Maximize coverage of the goal line

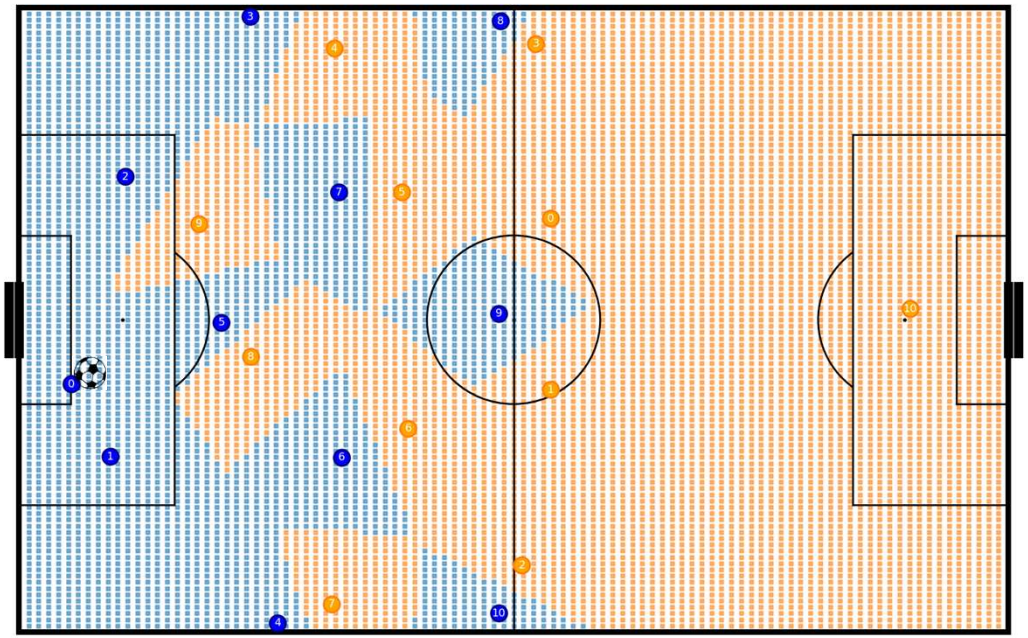
Tiago Mendes-Neves – up201406104@fe.up.pt



Criteria 3

- Maximize coverage of pass lines
- Maximize coverage of the goal line
- Minimize the distance to opponent players

Tiago Mendes-Neves – up201406104@fe.up.pt



Criteria 4

- Maximize coverage of pass lines
- Maximize coverage of the goal line
- Minimize the distance to opponent players
- Maximize pitch control area

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Heuristic

- Each criterion Cx will have a quantified value (we will normalize them between [0, 1]).
- The user will define a weight Wx for each criterion [0,1].
- $H(x) = \sum^{x} Wx * Cx$

Algorithms

Optuna (TPE/CMA-ES)

Hill Climbing, Simulated annealing

Genetic algorithms

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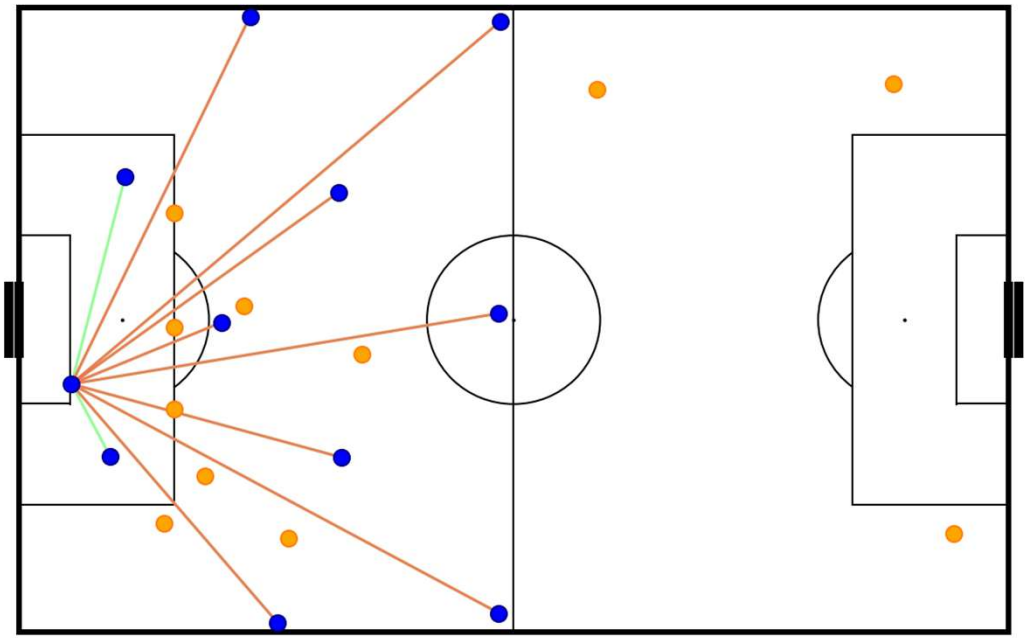

Progress

- Implementation of the criterions and the framework for weight selection
- Implementing the algorithms

Tiago Mendes-Neves – up201406104@fe.up.pt

Q&A

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