

Enhancing the Adaptive Abilities Mainz Rolling Brains 2001

F. Flentge, C.Meyer, B.Schappel, Th.Uthmann

Department of Computer Science
Johannes Gutenberg-University Mainz
D-55099 Mainz, Germany

1 Introduction

The Mainz Rolling Brains attend the RoboCup Simulation League since 1998. In Paris (1998) and Stockholm (1999) we made it to the semi-finals. In 2000 we redesigned the decision layer of our agents using a modular structure and participated in EuRoboCup (Amsterdam) and in Melbourne.

Besides the adjustment of our technical layer to the new soccer server, which provides the basis for all further development, our main focus is on enhancing the adaptive abilities of our agents and on improving the performance of our modules (especially ballcontrol and positioning) this year. We will collect and analyse data regarding our and the opponent's individual and team behaviour for online and offline adaption, thereby striving at reaching a new level of flexibility in the adequate respond of varying opponents' behaviour. The more complex the behaviour our agents are based on, the more difficult is their proper development. In order to overcome this problem and to improve the understanding of our agents' behaviour we are developing a special visualisation, testing and debugging tool called FUNSSEL, which will complement our already existing analysis tools.

2 Modular Design

This year's MRB soccer players are based on last year's players still using the three-layer concept explained in [2]. The three layers are the technical layer, the transformation layer (a collection of all skills and low level behaviours the player might use) and the decision layer which represents the player's "brain".

Since 1998 we use our own technical layer which turned out to be very flexible as changes to new versions of the soccer server could easily be done. The same holds for the transformation layer.

Last year we started with the modularisation of the decision layer ([1]). For that we distinguish between five different tasks, each task corresponding to a module:

- Standard situation module (e.g. kick off)
- Goal shot module
- Pass module (selection and realisation of passes to other players or into free space)
- Ballhandling module(e.g intercept the ball, dribble, tackle opponents)
- Positioning module (positioning of the players on the field, construction and avoidance of offside traps, long term stamina control)

The modules evaluate the adequateness and the chance of success of a particular action in the current situation and return a grade rating the chosen action. The module with highest grading will be called to act and is responsible for the execution of the action. The Master Control co-ordinates the evaluations and actions of the different modules and manages agent communication ([1]).

This year's efforts concerning agent structure will concentrate on the implementation of a so called feedback-routine in each module. This routine should be able to adapt the specific parameters of a module for example to the current situation of the match, the skills and the playertypes used by the opponent. It should also be able to rate the last actions of its own module.

The modules will use each other to evaluate possible actions of teammates and opponents, e.g. the chances for a succesful pass from the player controlling the ball to another player by looking at the game through the teammate's eyes. For this purpose there are special routines regarding own and opponent actions in each module. Since the modules change their ratings due to the feedback they get, we will adapt the team's behaviour to the opponent's behaviour.

3 Data Analysis

One main focus will be the gathering and analysis of data. We already used Self-Organizing Maps to classify the behaviour of single players ([3]). We were able to identify various typical behaviour patterns for different teams. The comparison between our and opponent patterns allows us to detect the superiority/inferiority of the teams in certain fields (e.g. dribbling and passing).

This year we will do more online-analysis and try to adapt to the opponent's behaviour. Data collection and analysis will be done by the coach using a special module, the tactical module. Typical data are the situation of the match, the opponent's tactical system and paths of ball and players.

To deal with heterogenous players the coach should observe the behaviour of the opponents and conclude the player types. He will then communicate the types to the whole team during standard situations. This information will be used to estimate the chances for several (own and opponent) actions, e.g. for passes or goal shots, so that we can adapt to the strengths and weaknesses of our opponents.

4 FUNSSEL - A Visualisation and Debugging Tool

FUNSSEL ("Flexible Utility for Network based Soccer Simulation using Extended Language") is a powerful utility to debug simulation league agents which replaces the tools we used in the years before and reconciles these and new abilities. It consists of two single programs, **funssel** and **funsselmon**.

funssel is a kind of proxy server that is placed between the soccerserver and the agents. It is able to start and stop the soccerserver during a game and allows to replay a just played or saved game from any timestep.

funsselmon is a 2D soccerserver visualization and a GUI to control funssel. It connects to funssel, is able to display games and it extends the language of the agents by debug commands which makes it possible to e.g. trace their decisions.

FUNSSEL will soon be contained in our sourcepackage which can be obtained at our website.

References

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3. M.Wuenstel, D. Polani, Th.Uthmann, J.Pperl *Behavior Classification with Self-Organizing Maps* Scientific Challenge Award, Proceedings of the Fourth International Workshop on RoboCup, Melbourne, Australia, 2000.