

# Kasra 2005 Coach Description

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**Abstract.** Our main scientific goal is designing a *Probabilistic Reasoning Expert System* that models the system through his observations of interactions. In this research we focus on coach analyzer as expert system. The main reasoning method that our team has especially focused on is using *knowledge bases* to inference with propositional logic.

In our approach we have tried to model the opponent team base on 3 patterns

- Modeling movement patterns of agents in the field
- Modeling major action of agents in the field
- Modeling ball movement patterns in the field

Expert system uses these models with its basic rules of modeling, and gathers major patterns that can recognize from offline information. Rules of modeling are depended on Clang as ruling's language.

After that patterns gathered, expert system score them and select some of best patterns base on its fuzzy logic, after it will try to simulate opponent actions with selected rules as them played in the game, and so if simulated system can be fuzzily match with real system then it add selected rules to his knowledge base.

## 1. Introduction

In our approach we have tried to model the opponent team, for this reason we have some basic rules depended on Clang as ruling's language. With these rules we gather some patterns from opponent's behaviors and scoring them, after select best patterns base on fuzzy logic and check them, after simulate them to check their nearest to actual model and if needed change patterns to gather best patterns, and add them to our knowledge base.

After these offline steps in analyzer online expert system match best patterns to current game and chaining on knowledge to find best patterns that used in this system, it used probabilistic reasoning base on fuzzy logic to do this.

## 2. Opponent modeling

In our approach we have tried to model the opponent team base on 3 patterns

- Modeling movement patterns of agents in the field
- Modeling major action of agents in the field
- Modeling ball movement patterns in the field

We gather some basic rules from expert persons that use them to select a known model of behaviors in opponent actions. As said we gather these rules from expert persons that can group base models in some distinct sections from popular model of actions.

This work can help expert system to find popular known models to make difference between different patterns for model them.

## 3. Pattern gathering

Pattern gathering are based on basic rules that said in previous section. These rules are putted in a knowledge base, in each time that analyzer analyze a game, it use this knowledge base and use forward chaining reasoning to find best patterns that used in a game. These patterns select base on parameters of expert system that shows the number of basic patterns that should match to a game pattern.

## 4. Knowledge base learning

After that patterns gathered from a game, a fuzzy logic base expert system try to score them with similarity of actions with parameters of pattern. After a simulator try to simulate selected patterns and match it to analyzed game. It is needed because that it is possible when we gather some of matched patterns together it wouldn't make best result because of overheads between some rules.

So in a few states expert system need to make a few changes, like a simple version of mutation in genetic programming.

After that expert system select best gathered patterns, it adds them to knowledge base as a new pattern and its major properties.

In next step we need some basic major rules that should important difference between different patterns, this step does with a knowledge base analyzer that check knowledge base rules and simple them.

### **5. Match opponent model**

Coach system has two different modules, offline analyzer that described in previous sections, and an online analyzer that coaching coachable agents to determine opponent patterns that they do in that game.

In this step online coach reasoning base on knowledge base that offline analyzer learned. In this step online expert system try to find basic patterns of games in running game base on basic rules that describe in section 1 and match current patterns to learned patterns that describe in knowledge base. In this way it uses backward chaining steps with fuzzy parameters that needed because of probabilistic of environment and try to find lost chains too proof existence of patterns.

It does it in someway like artificial neural networks and tries to weight knowledge rules and go on patterns that have better proofed rules.

### **6. Future works**

In this way we try to make a knowledge base expert system that can train some action patterns and match new patterns with learned patterns.

It do something like artificial neural networks, but it runs on real time, non deterministic system on discrete field on test bed of Robocup soccer simulation competition. After that checking its result on this test bed we like to extend it on real life systems like traffic control systems to predict traffics in city highways.

### **7. References**

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