CS 182 Homework 5 Mark Grozen-Smith

I define a soccer game as my theoretical environment.
I define a function hasball(x) which means agent x has a ball

$$hasball(x)$$

And another function wantball(x) which means agent x wants the ball

$$wantball(x)$$

I define all players as on team A or team B

$$\forall x player(x) \rightarrow Ateam(x) \oplus Bteam(x)$$

For all players, they want to have the ball if they don't already have it

$$\forall x player(x) \rightarrow wantball(x) \oplus hasball(x)$$

For all players, there exists one who has the ball

$$\forall x player(x) \rightarrow \exists x hasball(x)$$

For all players, there exists one who wants the ball

$$\forall x player(x) \rightarrow \exists x wantball(x)$$

If a player wants the ball, the player approaches the player with the ball

$$\forall x wantball(x), \exists y hasball(y) \rightarrow \exists x approaches(x, y)$$

If a player has the ball, the player avoids the player approching

$$\exists y hasball(y), \forall x approaches(x, y), \rightarrow \exists y avoids(y, x)$$

If a player has the ball, is not approached by anyone, and is near the goal, they will shoot

$$\exists y hasball(y), \neg\exists x approaches(x, y), \exists y near goal(y) \rightarrow \exists y shoot(y)$$

If a player takes a shot, the whole team gathers in celebration or anger

$$\forall x Bteam(x), \exists y shoot(y) \rightarrow \forall y approaches(x, y)$$

From this info I can see some interesting things. The agents are always interested in the ball or another player. Using these basic rules, we could program a simple robot to perform some pretty complicated instructions without us explicitly programming them.

We see with these rules that if you do not have the ball, you also are not avoiding anyone nor shooting the ball. We can start by saying person p doesn't have the ball. We then see that person p wants the ball. If p doesn't not have the ball, p is not being approached by anyone, and thus is not avoiding anyone. Also, if p does not have the ball, p is not shooting the ball.