A ball game with teams divided into A and B teams.

All are simplified situations, based on the fact that the football has no logic of its own movement and only accepts instructions.

Firstly, the kick-off: a random kick-off team. The kick-off team has 3 seconds to kick off and can pass the ball to any player on its side of the field. Let's assume that Team A kicks off and that Team A and the rest of Team B are in their designated positions in their own half of the field. After the kick-off, Team A takes control of the ball and Team B aims to steal the ball.

The following attacking and defensive logic is the default, and may change if the team is leading or behind, and the tactics are adjusted (depending on how far we can go in the end, the priority is to ensure the default runs smoothly)

**Attacking logic**.

Player with the ball: can choose: dribble, pass, shoot. In your own penalty area, the preferred option is to pass to a teammate, 60% chance. If the other players are less than 0.5m away from the opponent, then passed ball to the goalkeeper. 30% chance of choosing to dribble the ball forward. If the opponent is less than 0.5m away while still in the penalty area during the carry, switch to a pass. If in your own half and not in the penalty area,5%chance to shoot, 55% chance of choosing to pass, the passing logic remains the same. 40% chance of choosing to dribble, of which 60% chance of dribbling forward, 30% chance of dribbling sideways and 10% chance of dribbling backwards. if the opponent is less than 0.5m away, 50% chance of choosing to switch the direction of dribbling, 50% chance of choosing to pass, the passing logic remains the same. When in the opponent's half and not in the penalty area, 20% chance to shoot, 60% chance to dribble, when the opponent is less than 0.5m away, 50% chance to switch the dribbling direction , 50% chance to pass, when passing the ball, the priority is to pass forward, if there is no further forward to pass, then choose to pass back, not to the goalkeeper. 20% chance to pass the ball, when passing the ball, the priority is to pass forward. When in the opponent's box, the opponent is more than 0.5m away, 100% chance of shooting, in the remaining cases, 50% chance of shooting, 30% chance of dribbling, the dribbling logic remains the same, 20% chance of passing, the priority is to pass to a teammate in the box, the rest of the cases the passing logic remains the same. In all carry logic, the ball is carried for one second before re-entering the pass and shoot carry judgement, switching the direction of carry when the distance to the sideline is less than 0.1m.

Non-goalkeeper, when a player of your side is in possession of the ball in the opponent's half, the goalkeeper stands on the box line, the defender stays behind the striker, the non-goalkeeper has a 50% chance of running forward, a 30% chance of running sideways and a 20% chance of running backwards. They must not overtake the last player of the opposing team apart from the goalkeeper. When a player of your side is in possession of the ball in their own half, the goalkeeper stands on the goal line, the defender stays behind the striker and the striker has a 50% chance of running forward and a 50% chance of running sideways.

Special situations, free kick.

**Indirect free kick**: the player keeps the default possession and can only choose to pass the ball. Random pass object.

**Direct free kick**: if a direct free kick is awarded in your own half, if in the penalty area and served by the goalkeeper, the player has a 98% chance of choosing a pass, a random pass and a %2 chance of choosing a shot on goal. Striker standing in the opponent's half (not offside prerequisite), defender standing in his own half, if not in the penalty area, served by the defender, player has 95% chance of choosing to pass, random pass, %5 chance of choosing to shoot. The striker stands in the opponent's half (no offside prerequisite). If obtained in the opponent's half, not in the penalty area, more than one metre from the penalty area, served by a defender, 30% chance to choose a shot, 70% chance to choose a pass, 50% chance for the striker to stand in the opponent's penalty area, 50% chance to stand elsewhere in front of the defender. If 1m in front of the opponent's box, the striker takes a penalty and has an 80% chance of choosing to shoot. The other two players stand one in the penalty area and one behind the player taking the penalty. If inside the opponent's penalty area, the ball is a penalty kick and there is a 100% chance that a shot will be taken.

**Out of bounds**: The player closest to the position in bounds takes the penalty, only a pass can be made and a pass is chosen at random.

**Corner** : Set a player to take a penalty kick, 5% chance of shooting directly at the goal, 60% chance of passing, two teammates, one standing in the box and one standing one metre outside the box at random, 70% chance of passing to a player in the box, 30% chance of passing to a player outside the box. 35% chance of a tactical corner kick, one player waiting for a pass to be taken near the player taking the penalty kick 1 metre away.

**Goal kick**: Goalkeeper serves the ball, 99% chance of passing, random selection of the passer, 1% chance of shooting.

**Passing logic**: Passes within 2m have a speed of 1m/s, the receiver has a 10% chance of making a mistake and the ball randomly flies 0.5m/s 0.5-1m in any direction t, passes over 2m have a speed of 2m/s, the receiver has a 25% chance of making a mistake and the ball randomly flies 0.5m/s 1-2m in any direction (if you consider the ball taking off Short pass on the ground within 2m, above 2m pass is a long pass with an overhead ball)

**Shot logic:** for strikers, set a 70% chance of shooting anywhere within range of the goal, 30% chance of shooting outside of the goal. For defenders, set a 30% chance of shooting anywhere within the fans' range and a 70% chance of shooting outside the goal. The speed of the shot is randomized between 1m/s and 4m/s.

**Dribble**: make a move to kick the ball with your foot and the ball rolls forward 0.1m

**Defensive logic**:

when the ball is in the opponent's half, the striker runs towards the player with the ball, the defender stays in his own half and approaches the player closest to him as a priority (if two players are closest to one of them at the same time, the closer one approaches and the one relatively far away approaches the other player, and the same in all cases after that), the distance should be greater than 0,5m, when the distance is 0,5m, no more approaching, but at 0,5m radius distance near that player. When the distance to the player with the ball is less than 0.3m, there is a 70% chance that the player will make a tackle (30% chance that the striker will succeed in taking the ball off, 60% chance that the defender will succeed in taking the ball off,) and a 30% chance that the striker will make a slide (50% chance that the striker will succeed in taking the ball off, 80% chance that the defender will take the ball off, ). (When the ball is in the own half, 1m or more from the penalty area, each player still approaches the nearest player, other logic as above). Within 1m of the penalty area, the two players closest to the player with the ball approach the player with the ball and use the same logic for a tackle when it is less than 0.3m. Inside the penalty area, two players closest to the ball carrier approach the ball carrier and are less than 0.3m away, there is an 80% chance of tackle and a 20% chance of slide, with the same success rate (reducing the probability of fouls in the penalty area)

**tackle**: a random foot is extended and the target direction is set to the coordinates of where the ball is at the moment the foot is extended. Extend and then retract.

**Slide**: Throw your body out and lie down with your feet outstretched, set the target direction to where the ball is at the moment of reaching, reach out and then get up and retrieve. It is recommended that if the opponent or the ball is blocked at this point just clipping.

If two players are in overlapping positions, it is recommended that no physical collision is involved and clipping, except when blocking a shot or pass. If at this point the person's coordinates within a radius of 0.2m will overlap with the path through which the shot was taken, the ball is judged to have been blocked with the body. When blocking a pass, there is a 70% chance that get of the football , and a 30% chance that the football will randomly fly 1-2m in one direction at 1m/s into 50-50 ball scramble, when blocking a shot, 30% chance of a direct decision to gain control of the ball, 70% chance of the ball flying 1-3m in a random direction at 2m/s into a 50-50 ball scramble.

**Defending free kick.**

Indirect free kick: two players, other than the goalkeeper, stand within 0.3 metres of the nearest remaining attacking player, one player stands at random in his own half of the field

Direct free kicks: one player stands as a wall 1 metre from the starting position close to the goal, the remaining two players stand next to the other two attacking players. There is no wall for penalty kicks.

Corner kicks: two players approach within 0.2 metres of the two attacking players, the other player (a striker) has a 50% chance of standing at a free position in the penalty area and a 50% chance of standing at the opening arc of the home side's centre circle area

**50-50 ball scramble logic**: When the ball is not under the control of either team , the 50-50 ball scramble logic is entered. In this case 1: If the ball is uncontrolled due to a pass, the attacking team does not move at this point and the defending team still moves according to the defensive logic because the current setting is to pass with 100% accuracy and wait in place to receive the ball, there is no overpowering situation such as a direct ball. Situation 2: In the rest of the situations where the football is not under the control of either team (football beyond the 0.1m radius of the player in possession?) The two players closest to the football approach the football and whoever touches it first is the new attacker.

**Offside**: When, at the moment of the pass, the attacking player ready to receive the ball is positioned beyond the position of at least three players of the defending team, it is an offside foul and the opponent is awarded an indirect free kick in the offside position. This rule only applies when the attacking player is in the opponent's half of the field.

**tackle fouls**:

Current situation: 10% chance of foul for a tackle, 40% chance of foul for a shovel

（If the defending team touches the ball first, it is ruled a foul and a direct free kick is awarded (red and yellow cards are disregarded for the time being) If the defending team touches the ball first, case 1: only the ball is touched, not the opponent, no foul. Situation 2: If the defending team touches the football first and also touches the opponent but the opponent does not fall to the ground, there is a 40% chance of a foul. Situation 3: If the ball is touched first and the opponent falls to the ground, there is a 70% chance of a foul.

Body contact foul (not present if clipping): 50% chance of a foul if the opponent is knocked down.

**Handball**: the ball hits the hand of either team (except for the goalkeeper in the box) and a direct free kick is awarded

**Handball by the goalkeeper**: the goalkeeper receives the ball intentionally returned by a player of his own team with his hand (for simplicity, he receives the ball with his hand), the opponent is awarded an indirect free kick in his own penalty area

**Dead ball judgement logic.**

**Corner kick**: the defending player touches the ball off the line, the position of the corner kick depends on where the ball goes out of bounds (in 2d terms, the ball goes out of bounds on the baseline above the goal and is served in the corner above the goal,)

**Goal kick**: the attacking player touches the ball off the line and the goalkeeper takes the goal kick from anywhere in the box

**Out of bounds**: whichever side touches the ball off the touchline, the other player gets the ball out of bounds

**Goalkeeper logic**: move to the box line when your side is attacking in the opponent's half, stay on the goal line the rest of the time (in reality the goalkeeper's logic is more complex when moving without the ball,so I suggest not let the goalkeeper move). The goalkeeper can use his hands to block a pass or a shot from the direction of the goal in penalty area(if the goalkeeper could hold the ball with its hands, then it can holds shoot less than 2m/s. In the remaining cases, the goalkeeper will save the ball away in any direction at the speed of the shot, if the direction is towards his own back, the ball is ruled out of bounds and a corner kick is awarded) . If he can hold it, the goalkeeper will have 6 seconds to control the ball and can choose to throw his hand away from the big foot (difficult to implement this object movement logic), throw the ball by hand, or put the ball on the ground for handling (it is recommended to choose only this situation,because it's simple). At the same time, according to the coordinates of the goal position that the ball will fly towards when the opponent takes the kick, the goalkeeper moves at 0.5m/s like that position, and when the ball is only 1m away from the goal if it still hasn't moved into place, then a save is made (can it really do a fish leap to save?). If not, fall sideways to the ground) (if the shoot will go out of bounds, then no movement)