

ROAD TOWARDS THE CONSTRUCTION OF ONTOLOGY OF COLLECTIVE SPORTS GAMES

Leo Pavičić¹, Mislav Lozovina², Vinko Lozovina³ and Dobromir Bonacin⁴

¹ Independent Researcher, University of Zagreb, Croatia

² Faculty of maritime studies, University of Split, Croatia

³ Independent Researcher, University of Split, Croatia

⁴ Faculty of Social Sciences dr.M.Brkić, University of Herzeogovina, Međugorje, Bosnia & Herzeogovina

Review paper

Abstract

A comparative analysis based on the analysis of the rules and practice games in four collective sports games (football, handball, basketball and water polo) generated the key terms exhaust all the aspects of games. Based on the comparative analysis of the rules we made the unification of four games through basic categories: space game, substrate, and the course of the game players. From the practice of playing unification was made for basic categories-terms arising from the flow of the game: Local / group skill (play the game), Tactics, Collectivistic, Match - Strategy and the game itself. These procedures were necessary to create a foundation on which to build ontology with the introduction of further hierarchical relationship all the possible connection between these concepts given as a prerequisite for the development of ontology's on the computer.

Key words: football, handball, basketball and water polo, game rules, game, ontology

Introduction

Ontology in computer science (computer science) is a relatively new area that is becoming more widespread in various scientific fields such as medicine, economics, biology, sociology, cultural anthropology, etc. Ontology consists of a set of terms that are used in the fields arranged in a structure that they each placed in a hierarchical ordered sets to determine its completeness and limit the area. With appropriate informatics tools to build ontology area there are numerous ready platform tools that allow the construction of the Internet platforms with contributions by authors from a given area. In the field of kinesiology and sports there are still no significant systematic efforts or projects at the level of other areas. This paper is an important step for the attainment of the goal (modelling sports games) set ontology (ontology at least sufficient for the scope of this paper). It is also a condition for the functioning of the model. In the field of computer science, ontology is a data model that represents a set of concepts within a given domain and the relationships between those concepts.

Such an approach is an explicit specification of some topic and it is used to reason about the objects within a given domain. The ontological approach is increasingly present in many scientific fields, and is further encouraged and facilitated by the availability of appropriate computer tools for construction and maintenance. Ontology's differ in respect to the scope and purpose of their content. The most prominent distinction is between the domain ontology describing specific fields of endeavour, such as in sports, and upper level ontology describing the basic concepts and relationships invoked when information about any domain is expressed in natural language.

The synergy among ontology's springs from the cross-referencing between upper level ontology's and domain ontology's various. Usually, describing the terminology and semantics that are used in a particular domain requires the collaboration of the people responsible for creating the vocabulary, those who review it, and those who will refer to it. Ontology thus, provides a vocabulary for representing and communicating knowledge about domain topics among scientists and practitioners. The ontology is described by instances, classes or concepts, slots or attributes, and their relationships, while attributes describe the relationships between objects as instances of a given class (concept). We have employed ontology to analyze extensional nature of classes defined by domain knowledge. Accordingly, in this paper we develop ontology of collective sports games and the nature of relationships among them. Our aim in this article is the development of collective sports games ontology. In this phase of the work we are developing a common skeleton of collective sports games phenomena terms as a hierarchy of sport specific classes that can represent a knowledge model of this sport domain.

Rules

Basketball

Basketball game is played by two teams of five players. The goal of each is to insert the ball in the opponent's basket and to prevent an opponent to win the ball and scores a field goal. The ball may be added, thrown, refusals, Eryngium or guided in any direction. Space games – Playground. Ground must be rectangular flat and hard surface with no obstacles.

Court dimensions are 28x15 meters ceiling height or low obstacles must be at least 7 meters.

Marks

Line: • Longer lines courts are called lateral lines and shorter front line; • Center line is parallel with the front lines and joining the mid-lateral line; • the free throw line is parallel to the frontal line and 3.60 meters long and 5.80 meters away from the front lines; • The center circle is drawn in the middle of the field and has a radius of 1.80 meters. Fields: • restricted area - part of the field bounded by the frontal line, free-throw line and the lines that start from the front line, with the outer edges of 3 meters away from the middle of the front lines and terminating at the outer edge of the free-throw line; • field of free throws - the field restrictions continued in court semicircle radius of 1.80 meters whose centre is in the middle pouring the free-throw line; • field three points - the entire surface of the field except the playground near the opponents' basket, which is bounded and includes: two parallel lines which start from the front lines, 1.25 meters from the side line and the arc radius of 6.25 meters, which is connected with parallel lines, and the centre of the harbour must be a point on the floor with the perpendicular through the centre of the opponents' basket and away from the front line 1575 meters.

Equipment, actors and rules

Boards: The sheet size may be 1.80 meters horizontally and vertically 1:05 meters and the lower edge is 2.90 m from the floor. The front panel surface must be flat and the edges are marked lines. Above the rim drawn a rectangle measuring 0:59 meters horizontally and vertically 0:45 meters. The board is set perpendicular to the fall and parallel to the frontal line and away from the front line 1:20 meters. Hopper: Recycle consists of a ring and mesh. Rim diameter 0.45 meters and the upper edge is horizontal distance 3.05 meters from the floor, and 0.15 meter from the plate. The mesh is set to retain the ball for a moment that passes through the basket and must not be shorter than 0:40 meters or longer than 0.45 meters. Ball: The ball shall be spherical and must not be smaller in scale than 0749 meters and not greater than 0.780 meters and her weight should be between 567 and 650 grams. The ball must be filled with air so that after dropping to the floor from a height of 1.80 meters to the deflected height of between 1:20 and 1:40 meters, measured from the upper edge of the ball. Team: The team consists of 10 or 12 members. Five players during games on the playground (player) and can be replaced (deputy). All players of the same team are wearing a uniform manner in accordance with the Rules and each player separately carries the designation number. Playing time: During the game consists of either of the two halves or four 20 minute of four periods (quarters) of 12 minutes.

Between the periods of the game is to get adequate rest. Game starts: • Underperformance when the ball touches the player correctly after it reached its highest point; • After an unsuccessful free throw the ball remains in play and the ball touches a player in the playground; • After inserting the boundary lines of the ball touches a player in the playground. Play is stopped: • expires at the end of half time or period; • Judge to whistle; • sound sign for 30 seconds; • been scored against a team which has requested a minute of rest. Rule of 30 seconds: When the player comes into possession of "live" ball on the court, his team has to take the shot within 30 seconds. If the team that possesses the ball fails to throw the ball on a piece within 30 seconds, a beep sounds for 30 seconds. The period of 30 seconds starts when the player comes into possession of "live" ball, runs until the moment when a team loses possession of the ball or the expiration of 30 seconds. Minutes of rest Time-out for a period of one minute is granted to teams according to the following rules: • for the game of two halves are granted two minutes of rest in one half; • for the match of the four periods are granted three minutes of rest in one half (two quarters). During the minute intermission players can leave the pitch. Unused time-outs may not be transferred in the following period.

Referees: The judge's first judge and another judge who have their helpers. Judges lead the game according to the rules and the official interpretation of the FIBA-term determined by the World Technical Commission. The first referee tosses the ball at the start of the game. In case of disagreement the first referee makes a decision. Free Throws: Free throw gives the player to score one point from undefended throw to the basket from the position behind the free-throw line and inside the semicircle. Contractor free throw is the one on which is made personally at fault, or in some cases, any player designated captain. The player taking the free throw must not use any technique but must throw the ball so that it enters the basket from above or touch the ring before he touched the player, and must take the throw within 5 seconds. During the free-throw line more than five players may take place along the fields of free throws that are 1 meter. First place along the field free throw with both sides of the restricted areas may be occupied only opponents of the player taking the free throw. Players that take place along the fields of free throws must occupy alternating positions.

Throw the ball

Throw-after goal: Any performs pitching a ball from a position behind the front lines and can add a player who is on or behind the front lines. After the breach of the rules, or any other interruption of the game, the player who hit stands outside the boundary lines where the judge determines, at the point nearest the point where play was stopped, except directly under the plate.

Before throw the ball player may not make more than one normal step sideways. The player who hit must not touch the ball before it has touched another player, stepping into the court, to spend more than 5 seconds before ejecting the ball, throw the ball over the plate to another player on the court and not directly inject the basket.

Football

Space games – playground: Ground must be rectangular flat and hard surface with no obstacles. Dimensions: The playing field is a rectangle the length of at least 100 to upward 110 meters and a width of 64-75 meters.

Marks

Lines: • Longer lines courts are called side lines and the short transverse lines; • Central line - a line that connects the central point of both longitudinal line; • The centre of the field - is marked around it is drawn a circle of radius 9.15 meters; • The Penalty strokes - is located on an imaginary vertical line from the centre of the transverse line at a distance of 11 meters; • A semi-circle outside the box is part of a circle of radius 15.9 meters centred on the label penalty shot.

Fields

- The goal area - enclosing two vertical lines at a distance of 5.5 meters from the pier gate length of 5.5 meters from the lateral line and are connected to a line that is parallel to the transverse line;
- Criminal space - enclosing two vertical lines at a distance of 16.5 meters from the pier gate length of 16.5 meters of lateral lines and are connected to a line that is parallel to the transverse line;
- The angular space - a marked line radius of 1 meter from the hoist flags angle.

Equipment

Door: The door to find the middle of the transverse line and consists of two vertical pillars placed at equal distance from the angle flag apart by 7:32 meters connected to the horizontal crossbar which is at 2:44 meters from the ground. Doors are equipped with a network that is attached to the door pillars, the bar and the ground behind the door. Ball: The ball is round. Its outer part must be from goats or other permitted materials. Circumference of the ball must not be greater than 0.71 or less than 0.68 meters. Weight of the ball must be within the limits of 0396-0453 pounds. Air pressure in the balls must be between 0.6 and 1.1 atmospheres. Team: Match play two teams, each with a maximum of 11 players, of which one goalkeeper in the field and five substitutes. In the course of the match can be changed from 2 to 5 players. Equipment of players: Jerseys or shirts of the same team must be the same colour and on the back marked clearly visible numbers.

The goal must be uniform colour different from the other players and the judge. Playing time: The game consists of two identical halves 45 minutes. Between the two halves is a rest period of 5 to 10 minutes. The game starting when a player on the referee's signal hits the ball standing on the ground in the centre of the field of play in the opponent's half of the field for the game. The ball is not in the play until it exceeds the length of its circumference. From the kick can not be scored directly. Ball in play and beyond games: The ball is out of play when: • the whole exceeds the longitudinal or transverse line either by ground or air; • when the referee stopped play. The ball is in play at all other times from the beginning to the end of the game. Referees: For each match shall be appointed by the judge and contiguous judges. Referee decisions are final as well as the decision on the final result of the match.

Freekick

Set pieces are divided into two groups: direct and indirect, depending on whether out of them can directly score or not. For free kicks within its own penalty area, all opponents must be positioned at least 9.15 meters from the ball and have to stand outside the penalty area until the ball comes out of that space. When running outside the box all the players and the players must be positioned at least 9.15 meters from the ball. Before performing free kicks the ball must be stationary, and the player who took a free kick can not play it again until you hit it or not substitute another player. The place from which derives the free kick from the place of the infringement unless it is a place in the goal area (looks for the closest point on the goal area).

Penalty shot

Penalty performed with the point for a penalty shoot out. During this time, all players except accurately determined the player taking the penalty kick and past, must be within the field of play but outside the penalty area and the distance of at least 9.15 meters from the mark for the penalty kick. When performing the keeper has to stand (without moving the feet), on its transverse line until the ball has been struck.

Handball

Space games - playground

Ground must be rectangular flat and hard surface with no obstacles. Dimensions: The playing field is a rectangle with length 40 and a width of 20 meters. Ceiling height or low obstacles must be at least 7 meters.

Marks

Line: • Longer lines courts are called side lines and the short transverse lines; • the free throw line (deveterac) - the dotted line and is parallel and concentric on to 3 meters from the line of the goal goalkeeper area;

- Line meter - line length of 1 meter and there is a parallel in front of the middle door at a distance of 7 meters from the transverse line;
- The goalkeeper's restraining line (line 4 meters) - line length of 0.15 meter in the middle of the front door drawn parallel at a distance of 4 meters from the transverse line;
- Central line - a line that connects the central point of both longitudinal line;
- Line substitution - a line that is located at a distance of 4.5 meters from the center line and length is 0.15 meter.

Fields

The goal area - is marked by a line which is located at a distance of 6 meters length 3 meters to which each side per quarter circle with a radius of 6 meters with their centres on the inner rear corridor of the post. This line is called the goal area line.

Equipment

Door: The door to find the middle of the transverse line and shall be fastened to the ground. Door height is 2 meters and width of 3 meters. Equipped with the network that is suspended so that the inserted ball can not refuse. Telescopes door firmly connected crossbar and rear edges of the tripod must cover the outside of the transverse lines. Ball: The ball is made of leather or synthetic layer and must be round. Weight ball is 0.425-0.475 pounds and scope must be of 0.58 to 0.60 meters. Team: The team consists of 12 players. The team must play with one goalkeeper. On the surface at the same time can be located up to seven players (six outfield players and one goalkeeper) and other players are reserve players. In a match must occur at least five players. If during the game the number of players is reduced below five game can not continue. Field players must wear the uniform sportswear that colour and design must be clearly distinguished from opponents. Clothing goalkeeper must be different. Players must wear on the back numbers from 1 to 20th. Playing time: Search game lasts two times 30 minutes with ten minutes of rest between the two periods (half). The game begins with the whistle for the throw-off from the referee, and stops automatically terminating traffic light signal or signal the timekeeper. After the holidays are changing sides.

The judges decide on the termination and continuation of timekeeping games. They give the scorekeeper a sign to stop (time-out) and to re-initiate the time games. Suspension of play is marked with three short whistles, and continues to re-whistle. Referees: Match is lead by two equal judges who have helpers. First appointed judge at the opposite opinion decides. Secondly appointed judge opened the game (the court referee) sign the throw. Changing the judge in the field and a judge on the transverse line occurs after changing teams that attack.

The court referee whistles: • the execution of the all throws; • After an interruption of the game; • at the end of the game if necessary. The judge posted in the transverse line just whistling in the achieved goal.

Free Throws

The free-throw is no sign of a judge (whistle) in the place where the offense. If the offense was committed between the goal area line and the free throw, free throw is taken from the nearest town outside the free-throw line. Is your attacker with the ball in the right place, he is not allowed disposal ball on the ground or less the re-capture.

When performing a free throw, players from the attacking team must not touch or exceed the free-throw line, the players of his team must be in the field and outside the free-throw line. When performing a free throw, players from the opponent's team must be away from the pitcher at least three meters. When performing all throwing part of one foot must remain constantly on the ground and the other foot must be repeatedly picked up and put down again. The pitcher must throw the ball within three seconds, throwing is done when the ball left his hand. And all the throws can be scored directly.

Penalty shot

Penalty - penalty shot is performed after the whistle of the referee in the field of direct throwing the door within three seconds. When performing meter thrower must not touch or exceed the meter line before the ball has left his hand. After performing meter game can continue if the ball touches the goalkeeper, the post or crossbar door. When performing the meter from the goal area line and the free throw shall be placed no players other than pitchers. If the goalkeeper is exceeded its boundary line (4m) before the ball has left the hand launchers penalty shot shall be repeated if no goal.

Water polo

Water polo game is played by two teams of seven players. The aim is to each of them to reach a goal in the goal and to prevent an opponent to win the ball and scores a goal. The ball must be added, thrown, refusals (except closed fist) or guided in any direction. The ball must not be submerged under water.

Space games - playground

Ground is set in the pool minimum depth of 2.05m. Must be rectangular, measuring 30 X 20 m, with two goals, both sides, measuring 3X 0.90m and depth of the goal so that the entire ball has be crossed an imaginary goal line (minimum 30 cm). When playing in indoor pools height of free space above the waterline must be 9m.

Marks

Line: • Longer lines courts are called side lines and the short transverse lines; • Central line - an imaginary line half distance) connects the central point marked on the extent of longitudinal lines; • Water polo is played in the water and therefore are marked subspaces imaginary lines that connect the marks on the pages field. Visible marks must be placed on both side of the field indicating the following: • white markings-goal line and half of the field; • red tag-line 2m; • yellow tag-line 5m; • Space for exchange and entry of an excluded player is marked by red and is located on the cross the goal line by investing courses on the opposite side of the scorer's table; • Goal line is designed straight line connecting two goal frames.

Fields

- The restricted 2m is an area where it should not be positioned player to attack without the ball, except when the 2m level with the ball or behind that level;
- The restricted 5m is an area where it should not be positioned player to attack without the ball, except when the 2m level with the ball or behind that level. After a simple violation that is awarded and must be carried out with violations of, and within 5m player must not directly attempt on goal;
- The line half distance goalkeeper must not exceed.

Equipment

Door: The door to find the middle of the transverse line and attached to them. Door height is 0.90 meters and width of 3 meters. Equipped with the network that is suspended so that the inserted ball cannot refuse. Telescopes door firmly connected crossbar squared shape, and last edges tripod must cover the outside of the transverse lines. Ball: The ball shall be spherical with air chamber with a self-closing valve. It shall be waterproof, without external strapping or any covering of grease or similar substance. For men, the circumference of the ball must be from 0.68 to 0.71m, and the pressure in the balls 90-97 kPa (13-14 psi). Team: The team consists of 13 players. The team must play with one goalkeeper. In the playground at the same time can be located up to seven players (six outfield players and one goalkeeper) and other players are reserve players. In a match must occur at least five players. If during the game the number of players is reduced below five, game can not continue. Field players must wear uniform sports equipment - caps.

Caps shall be in a contrasting colours, other than solid red, and must be different from the colours of the ball. Judges may ask the team to put white and blue caps. Goalkeepers must wear red caps. The caps must be worn during the entire match. Playing time: Duration must be 4/4 by 8 minutes of actual play. Time to start measured at the beginning of each quarter or overtime when the player touches the ball.

Among the first, second, and third quarter and fourth quarter of the match will be a break of two minutes, and the second and third quarters of rest lasts 5 minutes. If after a time-out match ended in a draw, and needed a decisive result, it must be an extension of play after rest for 5 minutes. It will be played two halves of three minutes actual play with a break of 2 minutes for the teams to change sides. If the result at the end of two overtime are equal, must run penalty shoots out to get a winner.

Game starts

- The game begins with the whistle to start the game (release the ball from the hopper mounted on the centre of the field), and stops automatically terminating traffic light signal or signal the timekeeper
- after performing each free throw,
- after a goal is scored, performed with the centre, and opponents must be in their half of the field.
- After a time-out after completion of the second quarter teams are changing sides.

Play is stopped

- When the timer expires at the end of quarter.
- The referee gives the whistle when ads sign 30 sec (limited possession time).
- Scores a field goal.
- When the ball goes out from the field.
- At each whistles for light or heavy offense.

Rule 30 seconds

When the player comes into possession of "live" ball on the court, his team must attempt on goal within 30 seconds. If the team that possesses the ball fails to throw the ball into the goal within 30 seconds, a beep sounds for 30 seconds. The period of 30 seconds starts when the player comes into possession of "live" ball, runs until the moment when a team loses possession of the ball or the expiration of 30 seconds. Minutes of rest (time-out): Each Team is entitled three time-out pro match. Third time-out can be requested only in case of overtime. The duration of a timeout is 1 minute. The game must be restarted on the whistle of the referee, so that the team that has the ball the throw with half or behind the half distance, unless it requests a timeout before the penalty kick or corner throw - throw it must remain. If the time-out asked the coach of the team not in possession of the ball, the game must be stopped and a penalty throw shall be awarded to the opponent. Referees: Match is lead by two equal judges who have helpers. Their authority over the players shall be the whole time that they and the players are within the precincts of the pool. The judges decide on the termination and continuation of timekeeping games. They give the sign for meteorologists stop the clock (time-out) and to turn on the game clock. Suspension of play is marked with a whistle, and continues to re-whistle, or without the whistle when the ball has left palm performers offense under the rules of the game.

The referees must change the side of the pool before the start of each quarter or overtime. Judge gives blow the whistle: • the execution of the throw and after an interruption of the game and at the end of the game; The judge in the transverse line flags to signal when the achieved goal, corner, or naked car. His main decisions judges are not obliged to accept.

Free Throws

The free-throw is no sign of a judge (whistle) in the place where the offense. If the offense was committed between the lines of the goal area and 2m, free throw is performed with 2m in the level of the offense committed. When performing a free throw, throwing can be the player who is closest to the ball and without delay. When performing a free throw team players must be away from the pitcher at least 1 meter. The player must throw the ball and throw it done when the ball left his hand. The player can perform and throw himself. Then the ball is in play but a player can not score. And all the throws cannot be scored directly.

Penalty shot

Penalty – (five meter shot) must be performed after the whistle of the referee, immediately, as direct throw in the door. When performing the movement of the box player who performs it must be continuous until the moment when the ball has left the hand of performers. After execution of the throw, the game can continue if the ball touches the goalkeeper, the post or crossbar door. In carrying out of the throw the opponents must be separated from the contractor at a distance where they can not interfere with the performer. If the goalkeeper is exceeded its boundary line (goals line) before the whistle penalty must be repeated if no goal.

Comparative analysis of rules

Space games

In all team sports game space is defined as a rectangle that is a function of the number of players in the team. Objectives (goal, Recycle) are placed in the field by the same principle and in proportion to the size of fields. Additionally, the number of players is proportional to the size of the fields. Tags in playgrounds denote areas of special regime of use. As a rule, these are limits to keep the players in these areas or limitations of scoring.

There are limits in game mode because the same duels are treated with different penalizing. Therefore, each player must be aware of two basic facts. The first is phase of the game (attack or defence) and the other is his position in the playground. For example, if a player is to convert from an opponent and his team in the phase of defence has a completely different meaning than when his team is in to attack. Thus the same space is not the same for the players in the attack phase and in phase of defence.

The size of one player is dynamic and dependent on the time of the action. From the moment you enter in the ball possession; real space offensive team is a function of the conquest of space and the arrival in position to receive the ball and shot. In that action four players are contracted the time and the space. In the given time and position in the playground it directly determines the choice of the repertoire of possible actions. Dynamics of space in the defence is completely different. Games space in front of own goal is very condensed, and the space that is still the goal is the rarest and smallest of interest. This space dynamic in the defence are in addition to the function of the position of the ball. To estimate the importance of gaming space, either in defence or attack, a crucial role is played by the position of the ball in the playground. This effect position of the ball can be identified by gravitational influences that change the geometry of space. Therefore, the focus of the game (Trninić, Perica & Pavičić, 1995) determined by the position of all the players can be placed in functional relationship with the position of the ball in space games. Defensive line position the ball directly determines the possible correct position in the playground. One player directly with precisely defined actions (the one that holds the player with the ball and that has to be found on the centerline of the player with the ball - canter of their own goal) and other players who played in the defence position (zone), as they are their goal is not directly threatened in relation the position of the ball in the playground. It should be noted that the collective game takes place in terms of Newtonian physics which anticipate all the players. Therefore players anticipate all events related to the speed of the players and the ball inside the area events and that's playground.

Organisation of the competition

Unit competition's match (game) in which the two teams meet. Time and space are limited by the rules of the game. Control of the game by the rules performs judges. The match has an outcome that could be a draw or a win. The success of the team in the game expressed the points and the outcome joins the number of points earned. Game rules were adopted by consensus at the level of the corresponding world organization. Matches can be friendly or competitive. In every sport there are competitions at least the country level to the global level. Competitions can be organized as: tournaments, leagues, promotional and friendly competitions. League competition held at the level of each country. They are organized by and controlled by their regularity, the corresponding alliance. Therefore, every alliance has adequate authority and organization of words. Depending on the number of leagues can be organized on multiple levels, either in quality or numbers or a combination. It can be played by a single or double point system. A characteristic of this type of competition is that all clubs face each other in the same league competition. The tournament has more species.

Whose basic characteristics that all participants do not meet each other, but by groups from which the winner or winners of the group (one, two or three) form a new group and so on to the group from which to obtain the overall winner. Friendly and promotional games can be played at different levels. Whose basic characteristics that are in the official calendar of association and open to the public, and the documentation association always deluded as official.

Match

The match is the meeting of two collectives that takes place in space game and the rules of the game. The match has an outcome that can be lost, win or draw. Control the game performs different bodies: The judges, secretaries, scorer's table, delegates and controller events. The course of events in each game is leads with a standardized protocol and the official record. The teams in the game are managed by licensed coaches according to the rules laid down by the respective association. Each team has a "captain" who is the only designated for possible communication with the judges and officials in the game.

Conclusion

Comparative analysis of the rules of the game four collective sports games (football, handball, basketball and water polo) served us for the performance of common and unique dictionary. Dictionary is the first step for the construction of operational performance ontology. This dictionary refers to basic categories: - Rules of the game; - Space Game; - The organization of competitions; - Match. The basic concepts of games ontology organized as a tree are given in this paper in tabular form. This approach and above tables represent the first step for the performance of ontology on the computer and it is our first step towards establishing a new paradigm in the study of collective sports games. For the full performance of ontology on the computer will be necessary to define the relationships of all the concepts in terms of hierarchy and associated interconnections. Creating ontology's on the computer certainly is a long process that requires the engagement of a number of scientists and experts to their contributions incrementally augmented by terms and links to some versions of which could be described as complete but not final.

Table 1 Ontology, game terminus and structure

Game space - Rules			
	Fields of attack and defence	Front field	
		Back field	
	Fields along the transverse axis		
		Centar	
		Corner/out line	
	Target point		
		Basket	
		Goal	
	Limitations		
		Racket	
		6metres, 9metres	
		2metres	
		Box	
	Variable lines/ zones		
		Racket - time limit	
		Soccer offside	
		Handball - back ball limit	
		Water polo – 2m line & ball	
Surface			
	Characteristics		
		tough, plastic, flexible, fast...	
		Fast, optimal,. Slow	
	Type		
		Parquet	
		Grass	
		Water	
Game rules			
	Referees decision		
		Foul	
		Foul light/heawy	
		Foul &	
		Illegal position in field	
		Foul in attack/defence	
		Time/game expiration	
		Other rules deviations	
	Game parts in rules		
		Start	
		Game parts half/quarter...	
		Overtimes	
	Judges signs		
		Ball out of field	
		Timeout	
		Players changes	
		Players ejection	
		Score	

Table 1 (continuing)

Players			
	First team (reserves)		
	Operative game positions		
		In attack	
			Middle
			Front - attack top
			Middle - mid line
			Middle - back line
			Wing
			Front attacker
			Beck
		In transition	
			Middle
			Wing
		In defence	
			Front
			Middle
			Back
			Wing
	Positions – tactics roles		
		Attacker	
		Middle	
		Defensive	
	According to status		
		Main, game support	
		Captain	
	Technics		
		In attack	
			Without ball
			With ball
		In defence	
			Without ball
Locae/group tactics			
	Players taking		
	Blockades		
Individual tactics			
		According to position	
		According to personality	
	Game zones attack/defence		
		Before goal	
		Outside zone (far/wings)	
		Outside zone (farr-wings)	
	Attack		
		Positional	
		Counterattack 1 or more	
		According to field zone	
			Front line
			Middle line
			Back line
			Wing
	Defence		
		Zone - space	
		Player - player, Pressing	
		Combined	
		Of obligation - glue	
	Transition		
		Counterattack	
		Transfer in positional (att./def.)	
		Rest, changes, breaks	
Colectivity			
	Communication		
		Direct	
			Verbal
			Special game vocabulary
		Indirect	
			Visual
	Stigmergic (comm. without comm.)		
		Inside team	
		With opponent	
		Between teams	
		With judge	
		With auditorium	
Game - strategies			
	Outcome		
	Before opponent		
	Turnament/league – strategies		
Game			
	Paydia		
	Ludus		
Game - strategies			
	Outcome		
...	Results importance
	Turnament/league – strategies		

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PUT PREMA IZGRADNJI ONTOLOGIJE KOLEKTIVNIH SPORTSKIH IGARA

Sažetak

Komparativnom analizom utemeljenom na analizi pravila i prakse igre u četiri kolektivne sportske igre (nogomet, rukomet, košarka i vaterpolo) generirani su ključni pojmovi koji iscrpljuju sve aspekte navedenih igara. Temeljem komparativne analize pravila napravljena je unifikacija četiriju igara kroz temeljne kategorije: Prostor igre, Podloga, Tijek igre i Igrači. Iz prakse igranja unifikacija je napravljena za osnovne kategorije-pojmove koji proizlaze iz tijeka igre: Lokalna /grupna taktike (igra u igri), Taktika, Kolektivitet, Utakmica – strategija i sama Igra. Ovi postupci bili su nužni za stvaranje temelja na kojima se može izgraditi ontologija uvođenjem uz daljnji hijerarhijski odnos sve moguće povezanosti između ovih danih pojmova kao pretpostavka za izradu ontologije na računalu.

Ključne riječi: nogomet, rukomet, košarka i vaterpolo, pravila igre, utakmica, ontologija

Received: July 24, 2013

Accepted: September 10, 2014

Correspondence to:

Leo Pavičić, MSc

Independent Researcher

University of Zagreb

10000 Zagreb, Rendičeva 28 b, Croatia

Phone: +385 (98) 407 836

E-mail: leo.pavicic@gmail.com