

# Creative Minds Challenges (CMC) Team Description Paper , RoboCup 2013

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**Abstract.** CMC Team works with the goal of implementing a system to analyze the movements of the players in the form of a two-person team.

## 1 Introduction

CMC team works by analysis of the opposing players packed on plying ground ,This is done by Coach and in specified interval the classified information is transmitted by Coach to the players. and each player acquires datas which required for various skills (passing, dribbling, etc.) , this is done by following steps:

1. The first step of our work will be on basis of dividing regions dynamically in such a way that in first each 1000 cycles congestion of regions increases (Cause will distribute later ).
2. Analysis positions of opponents by coach.
  - 2.1. record opponents positions by coach and classificate player's location data in tables in such away. (each player has its own table).
  - 2.2. Classification of information for each table for the region and to determine the weight of each region.
3. transfer region's weight to the player.
4. Analysis weighted region by each player and identify lucky (preferable) path for dribbles.
5. Find out the dangerous regions in defense and its coverage .

## 2 Packing District

### 2.1. The Dynamic Region

the first thing is packing the regions, it would be in dynamic pattern .

We know that at the beginning of the match our data is too small and by passing time mount of player's locations data will be increased, then we can reduce the mount of regions.

we know that the smaller regions more accurate information can be gained but the smaller region can be useful to a certain extent.

If we start from the beginning with a small region, we will be earned many region with same weight, that this status doesn't have any profit for us goal.

we first consider larger regions and in Specified period of time, we reduce the size of regions as we've shown in Figure 2-2.

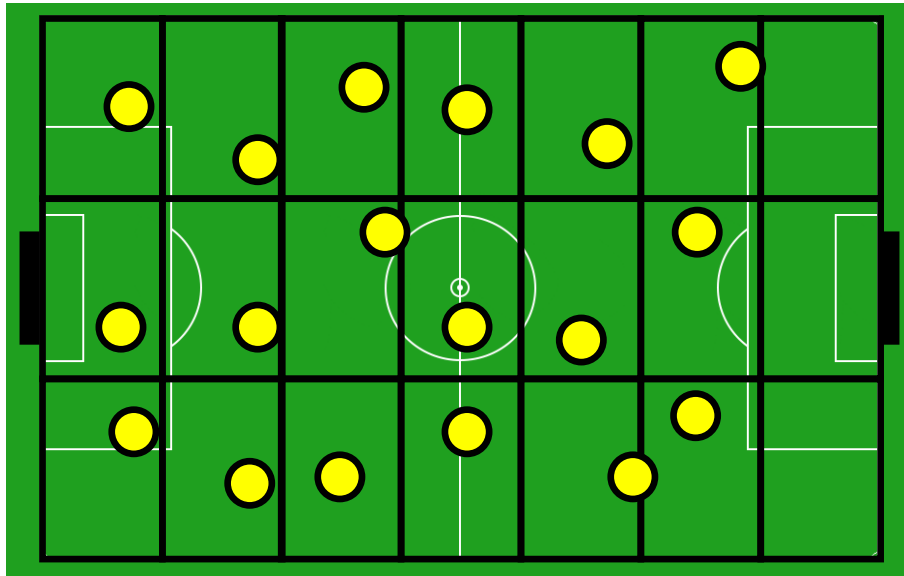


Figure 2-1

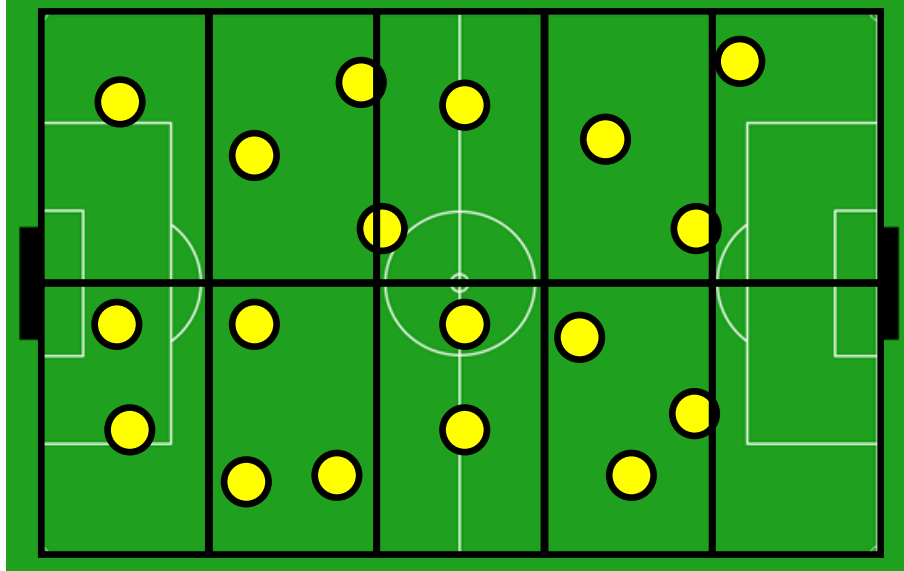


Figure 2-2

As can be seen by enlarging the size of the region, weight of the region will be increased, hence at first we use the larger regions and in first of each 1000 cycle , we reduce the size of the region to increase accuracy.

Accuracy of measure by increasing the number of regions. as we discuss the packing district rule in 2.3 section.

## 2.2 . Aspect ratio of each region

to calculate the aspect ratio of each side of region we require ratio unit, to obtain such ratio we consider a condition that opponent position been on width of region (X-axis) and own player on opposite side which wants to cross width of region.

the width and length of region are considered as “X” and “Y” respectively. The velocity (speed) of own player and opponent are considered as “ $V_{tm}$ ” and “ $V_{opp}$ ” respectively.

X	Width of region
Y	Length of region
V <sub>tm</sub>	Speed of own player
V <sub>opp</sub>	Speed of opponent

Table 2-1

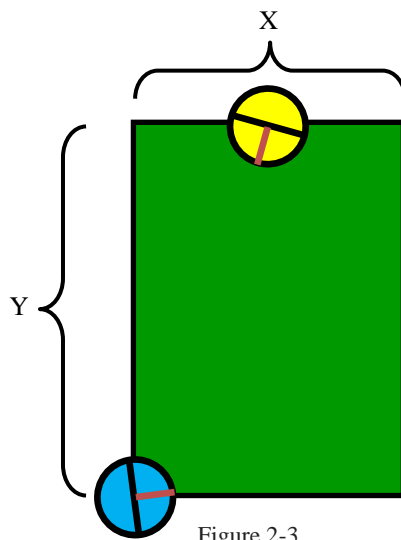


Figure 2-3

$$x = vt$$

$$X = V_{tm} \times T_{tm} \Rightarrow T_{tm} = \frac{X}{V_{tm}}$$

$$Y_{opp} = Y - (\text{kickable area}) = V_{opp} \times T_{opp} \Rightarrow T_{opp} = \frac{Y - (\text{kickable area})}{V_{opp}}$$

Given that players in each cycle do one of main command (here seen **kick** or **dash**), The player that it was owner of ball moves with slower speed than opponent. So we have the following equality:

$$\frac{0.72}{V_{tm}} = \frac{1.05}{V_{opp}} \Rightarrow V_{opp} \approx 1.46 V_{tm}$$

$$\frac{X}{V_{tm}} = \frac{Y - (kickable\ area)}{V_{opp}} \Rightarrow Y = 1.46X + (kickable\ area)$$

Formula 2-1

### 2.3. method of district packing

Using a series of trained numbers and coefficients in six step aggregation of regions will be increased.

For example, if we use the following series of numbers:

2      3      5      7      11      19      29      37

In the first stage the regions are mad by factor 6

$$(2 \times 6) + (3 \times 6) + (5 \times 6) + (7 \times 6) = 102$$

each number in parenthesis (such as 2x6) is width of each region level. The sum of 4 prime number are 102 which is near to field length 105 if we continue the series the sum will be 168 which is much greater than field length.

Widest region are near to own goal and narrow regions are near to opponent's goal.

Then put each width in formula 2-1 and calculate length of region and then calculate mount of regions in each region's level. (At least two regions in each level).

Most dense region is classified as follows:

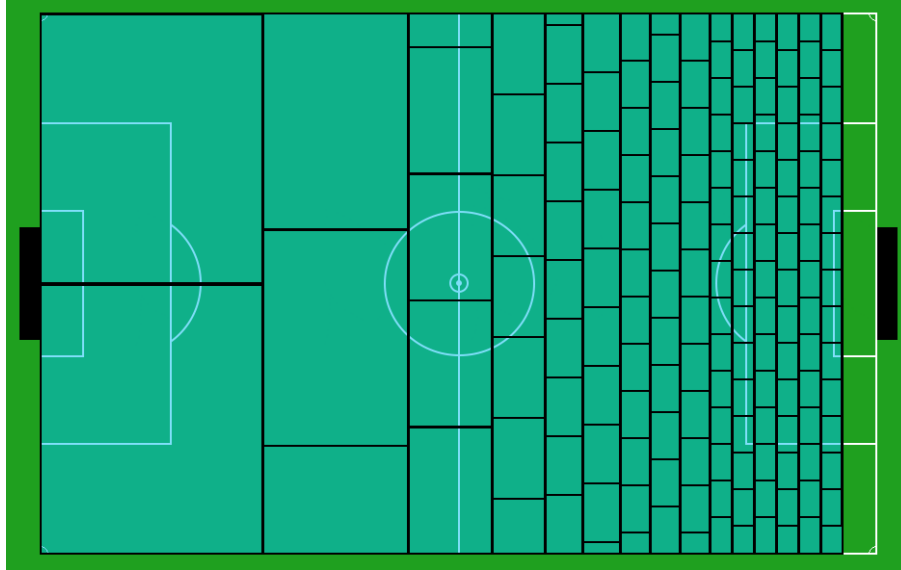


Figure 2-4

### 3 receive and classify positions of opponent

location data of each opponents analyzed by coach in specified time period in stored lists and matched the lists with regions and specify weight of attending player in region. (each opponent has own list) Consider the following example:

X	Y
3	20
1	20
-1	19
-4	19
-10	19
-11	20
-11	21
-12	21
-13	22

Table 3-1

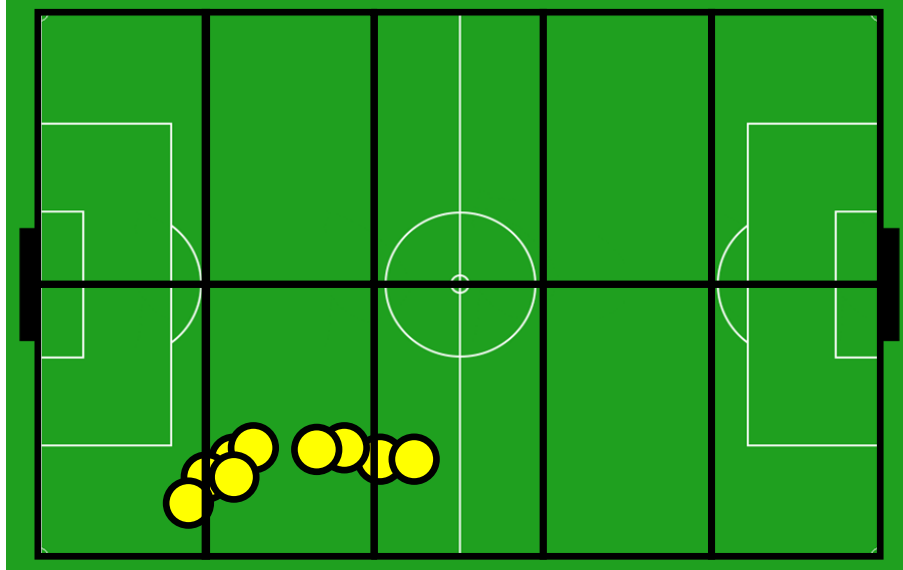


figure 3-1

According to table 3-1 and figure 3-1 weight of two identified region on the figure are calculated , As can be seen the right region has weight equivalent to 4 and the left region is 5 , similarly weight of all regions calculated and stored in list.

#### 4 Sending information to players

For sending information to own players first find out defense opponent's players and then classified information of each defense player then sending regions that they have highest weight.(At least three regions per each players are sending).

#### 5 Analysis of weighted region by each player

According to information obtained by each players from coach , when the own players saw an opponents with respect to the range of motion of the opponent or opponents, tend to lower weighted region in their decision making.

## **6 Find out the dangerous regions in defense and its coverage**

According to analysis carried out and the average weight of regions near to own goal ,The opponent's attacking style are estimated and by changing positioning of defense players will cover high-risk regions.