2D and 3D Motion Analysis

Dejan Eldic, Faculty of Kinesiology, Zagreb
Mgr. Martin Sebera, Ph.D. , MU

In this project I will analyze one activite – squat.

The parameters that will be measured are :   DISTANCE,
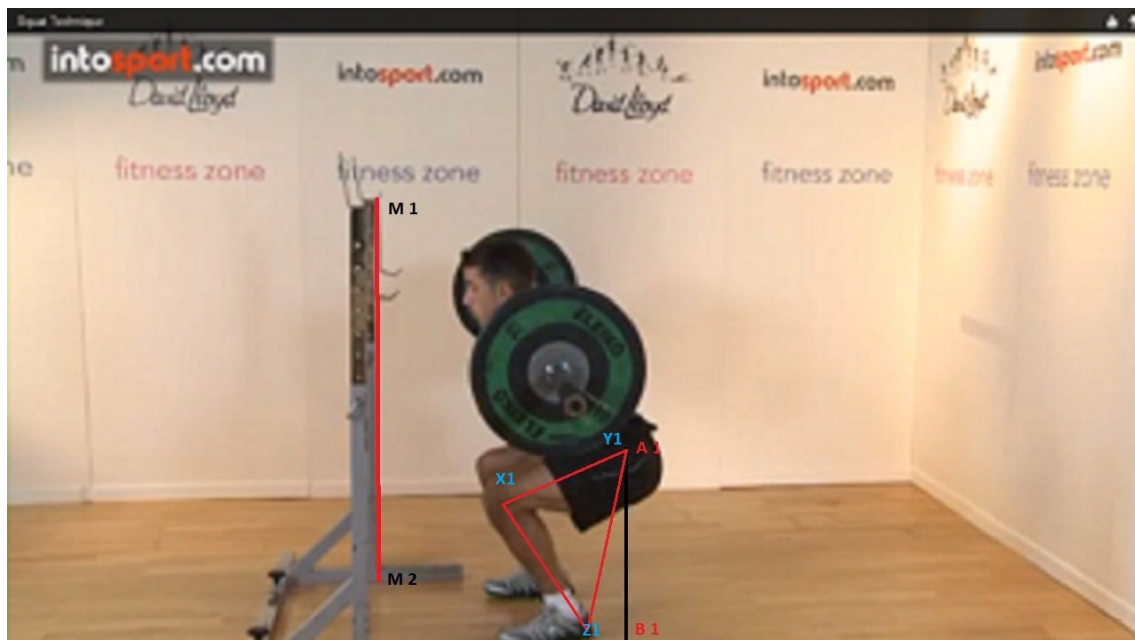ANGLES &
VELOCITY.

DISTANCE :

For the distance I used already known length of the squat rack.

It's universial for the squat rack made by ELEIKO like is on the picture and it is : length :1400 mm (140 cm) .
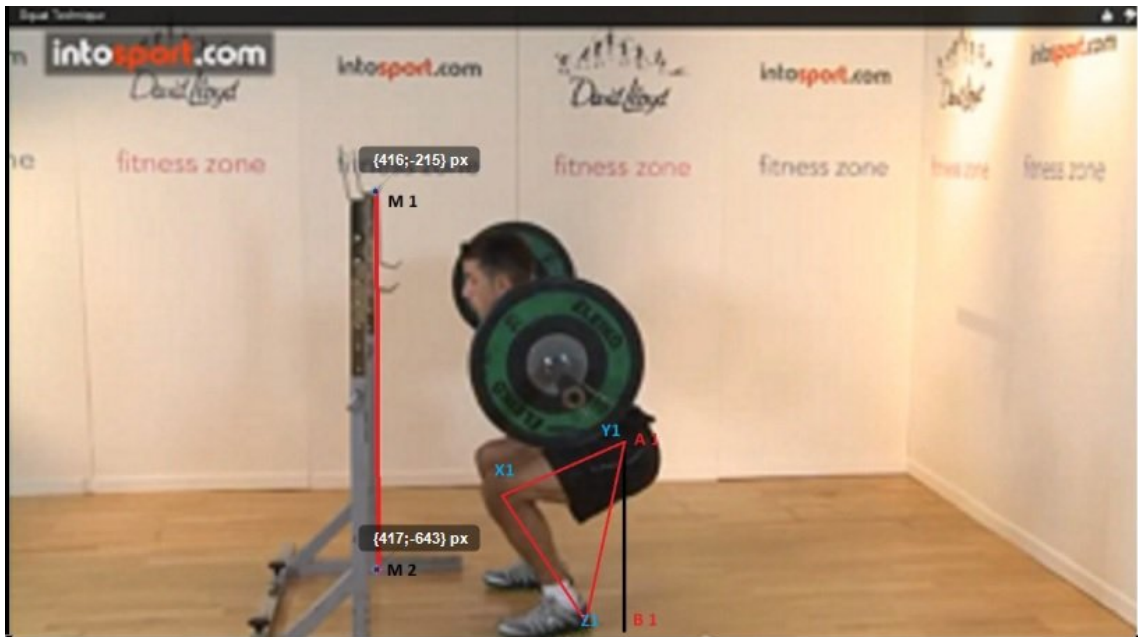
Taking as a reference the length of the squat rack which is 140 cm, I will calculate how many pixels correspond to this distance.

M1 and M2 = length of the squat rack.

$$\left| \overline{AB} \right| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

I will use this formula to calculate distance between two points.
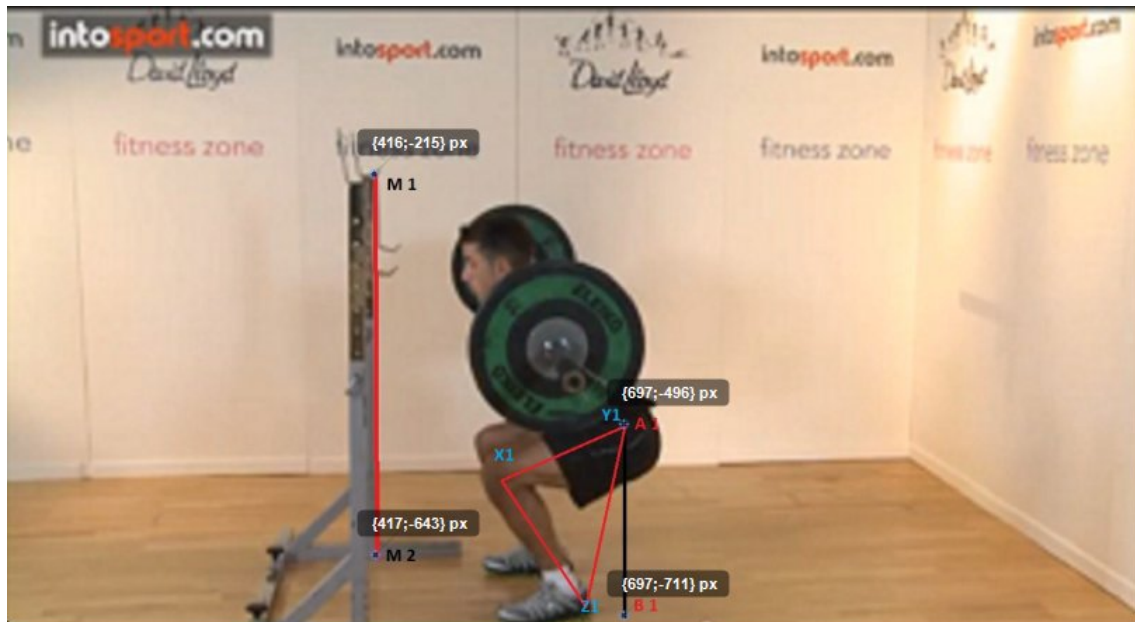

	M1	M2
POINT 1	417	-215
POINT 2	417	-643

Distance/length = 427, 998

1.40m = 427, 998 pixels

I will use this distance to calculate distance between his hips and floor and how far was the distance from begining and to the end of the squat.

I calculated distance from hips to floor (A1 – B1) and result is X.

I used simple formula cause I knew the distance of the rack.

1.40m = 427, 998 pixels   X =215*140/427,998

X= 0.703 m   - distance between the hips and floor when man is down

in the squat

D1, D2 = distance between hips and floor.

I calculated it by :

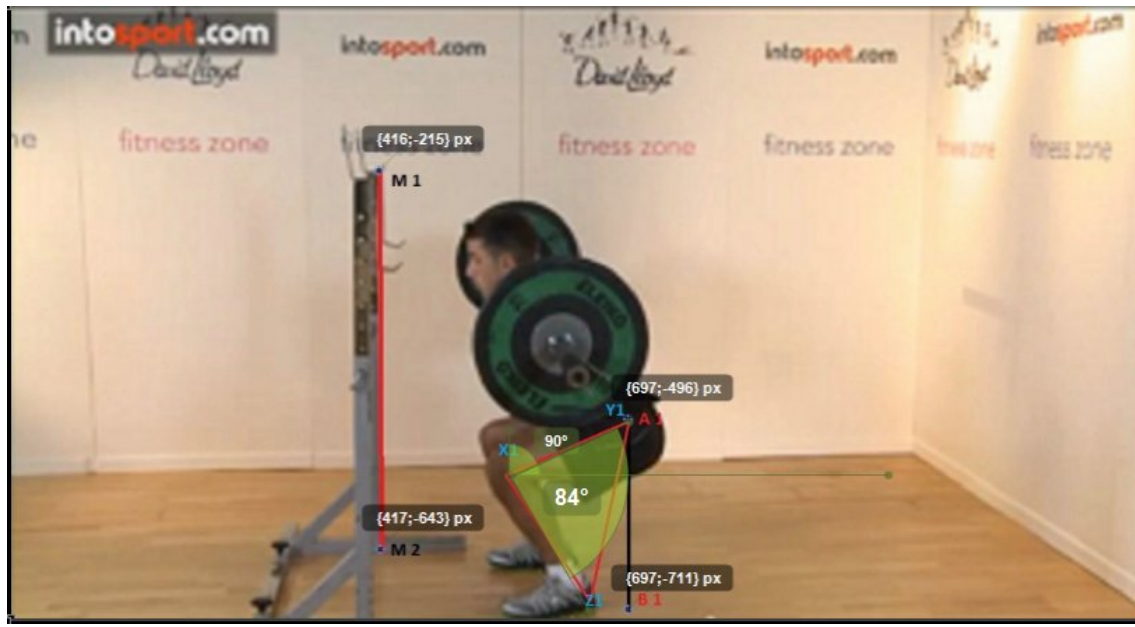$$\left| \overline{AB} \right| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

	D1	D2
POINT 1	675	-350
POINT 2	675	-714

D = 364 pixels

D= 119 , 065 m - distance between hips and floor when man is up – stability position.

(D= 364*140/427.998)

ANGLES

Like the pictures shows, the angle is 84 degrees which is quite correct and properly for the squat because recomended degrees for the squat is 90 degrees.

To calculate the angles I used program from the internet.

SPEED

Formula :

V = e/t

e = x2-x1
    119,065 – 70.03 cm = 49.035cm

t = time from begining to the end of squat is 5,24 sec – (calculated by movie maker)

V= 49,035/5,24 = **90,36 cm/s**