TSBB11 - Requirements

Football positioning

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1   Project group

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2   Problem formulation

The project aims to determine the 3D position of a football in real-time using a 2D image sequence from mono cameras. Image coordinates of the ball are already extracted by the customer. The problem lies in determining the height of the ball relative to the ground using only 2D images. The height of the ball should be estimated as a numerical value and classified as different intervals, on the ground, reachable or unreachable. The size of the ball can be used in some extent but the goal is to estimate the height of the ball without using its size. The real data contains noise and therefore the model should be robust to noisy data. There exists no annotated real data, instead synthetic data will be created and used for training.

3   Evaluation criteria

When using the synthetic data set, the estimated ball position as well as the ground truth are known. By these coordinates the accuracy of the method can be evaluated using some error metric. The whole sequence of the trajectory will also be evaluated and a mean error will be calculated. When classifying the height of the ball as different intervals the model will be evaluated using the accuracy from the confusion matrix between the different classes. Evaluation will be performed on the synthetic data. Evaluation can also be performed on real data if test data is provided by the costumer.

4   Minimum requirements

- A synthetic data set containing ball coordinates is created. The data set should be based on balls moving in parabolic curves. The data should be represented in 3D world coordinates and projected to a 2D image plane.

- The model can estimate the height of the ball in different intervals; on the ground (< 0.5m), reachable (0.5 - 2m) and unreachable (> 2m).

- The height of the ball is determined using an analytic method with knowledge of the ball size.

- The problem can be solved using an non-analytic method.

- The problem can be solved with moderately noisy data (including ball size) using an non-analytic method.

5 Extra requirements

- A framework for managing data sets is created.

- A synthetic data set with graphic representation of ball trajectories e.g. using a game engine is created.

- The model can use image data as input.

- The model can handle different camera parameters.

- The model can handle missing detections and false detections.

- The model uses recurrent neural networks to increase performance.

- The model can estimate the height of the ball as a numeric value.

- The model can determine the height of the ball without knowledge of the ball size.