

iShot – Billard Analyse

Subject: Informatik

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This projects goal is to create an application which allows to automatically analyze the ball movements during a game of billiards. This movement analysis is achieved by a lightweight receiver program analyzing the game in real-time and deciding on whether or not there is any ongoing movement of balls on the table. This receiver then records every shot as a separate scene. Using this recorded data, the post processing application then analyzes the shot in full resolution and with greater precision. The data is afterwards displayed in 3D space.

Real-Time Blob Tracking Assisted Receiver

The Photonfocus DR1 transmits modulated image data over a wired gigabit Ethernet connection. Due to the high data throughput, the incoming images have to be buffered in primary memory, later to be written to a hard disk drive. This suggests that images are only written to the buffer whilst a ball is moving, so that the buffer can be emptied while the game rests.

In order to determine whether or not this is the case, a real-time processing pipeline, surpassing the speed of the image sequence, was introduced. This pipeline can currently process incoming images up to a framerate of 125 frames per second.



Screenshot of the WebGL-powered analysis application.

Interactive Post Processing Application

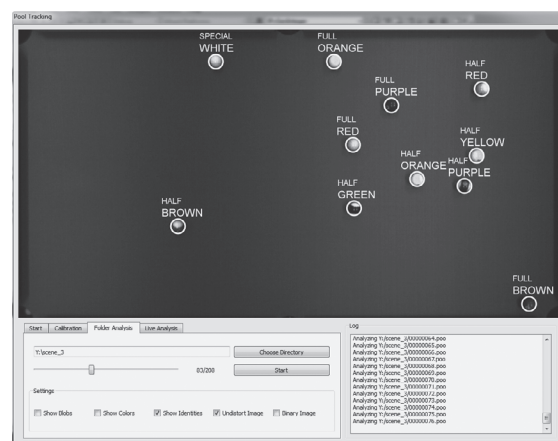
The postprocessing application is able to either analyze separate previously recorded shots or run simultaneously with the receiver. In the latter case, every shot is processed right after all the balls are resting. Images are processed in full resolution at 2048 x 1088 pixels and a resulting accuracy of approximately 1.5 mm per pixel.

The balls are identified using various measurements of their shape and color. Combined with a more sophisticated version of the real-time blob tracking algorithm, the positions of the balls can be determined even if the balls are covered by objects, i.e. the cue, for a relatively short period of time.

3D WebGL Visualization

The data generated by the detailed analysis of each shot is exported as a JSON file, which can then be consumed by virtually any programming language or technology.

As a proof of concept, a simple WebGL based player was created, displaying the positions of the billiard balls in three dimensional space.



Screenshot of the post processing application.



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