SIMPLE CAMERAS FOR COMPLEX THINGS

- A computer **stereo vision system** used for extracting 3D information from camera frames.

- Applications
  - Object tracking and speed measurement
  - Mobile robotics
  - Security and surveillance
  - Intelligent transportation systems (ITS)
  - Sport training assistant and statistics

What mobiXeyes does

- The system estimates tennis ball velocity in beach racket games.

- Velocity estimation is based on high frame-rate cameras and machine vision algorithms.

- A software component stores and visualizes measurements (video wall) and extracts statistics.

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Velocity Calculation

- **The mean velocity is estimated in the background area by**
  - Calculating the distance the ball has travelled
    - Stereo vision algorithms estimate the coordinates of ball in space
    - Known coordinates of entry and exit point
    - If more than two positions are available, they are used for improving the accuracy
  - Knowing the travel time
    - Each frame is time-stamped

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mobiXeyes description

- The system estimates ball velocity in beach racket tournaments

- Velocity estimation is based on high frame-rate cameras (>130 fps) and machine vision algorithms

- A software component stores and visualizes measurements (video wall) and extracts statistics

mobiXeyes can:
- Accurately estimate ball velocity
- Calculate game statistics per player
- Count dropped balls

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Components

- A dark background that improves clarity during ball traversals
- Two cameras implementing "stereo" vision, i.e., estimating the exact depth of the ball (z-axis)
- A software component for estimating ball velocity based on sequential ball positions in 3D
- A software component for managing, visualizing, logging & printing system data
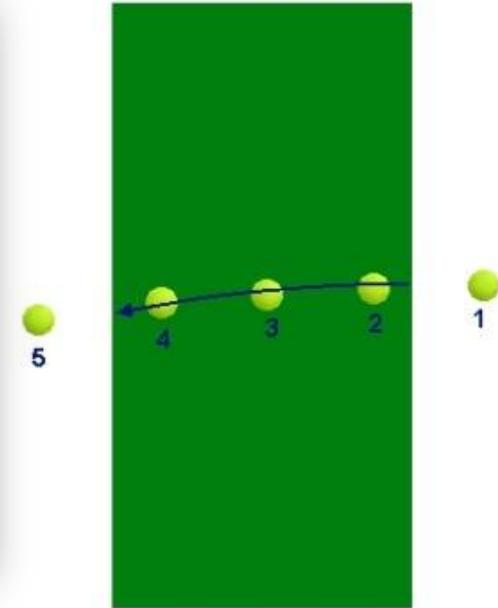- Displays and Speakers

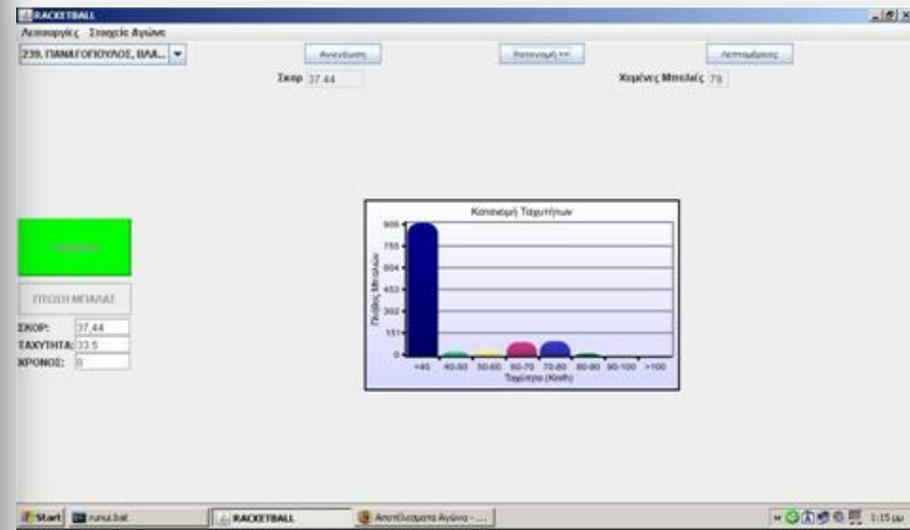mobiXeyes
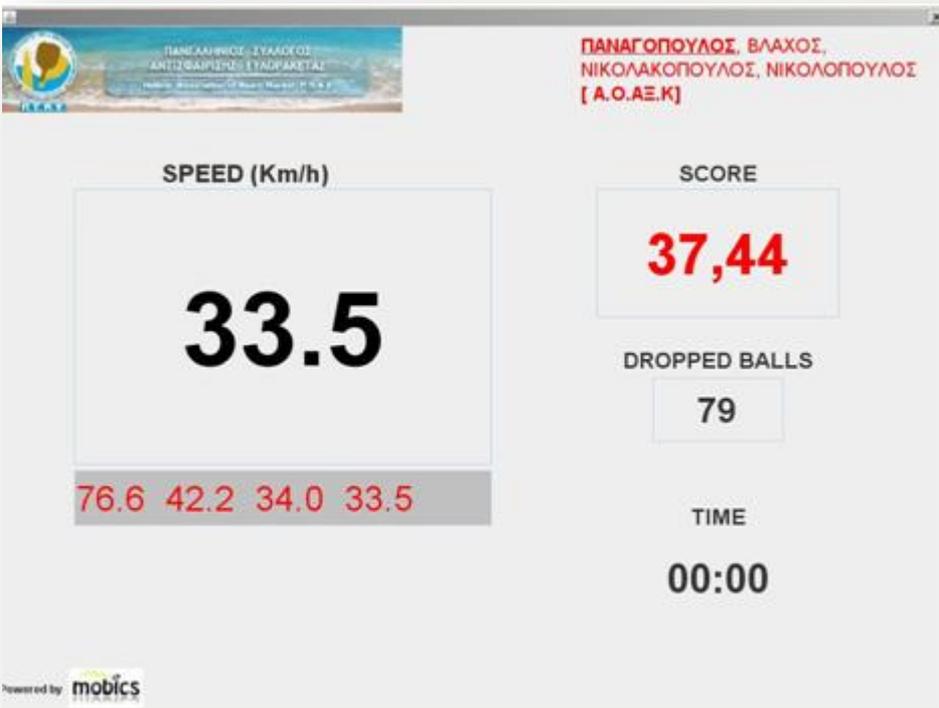STEREO VISION TECHNOLOGY

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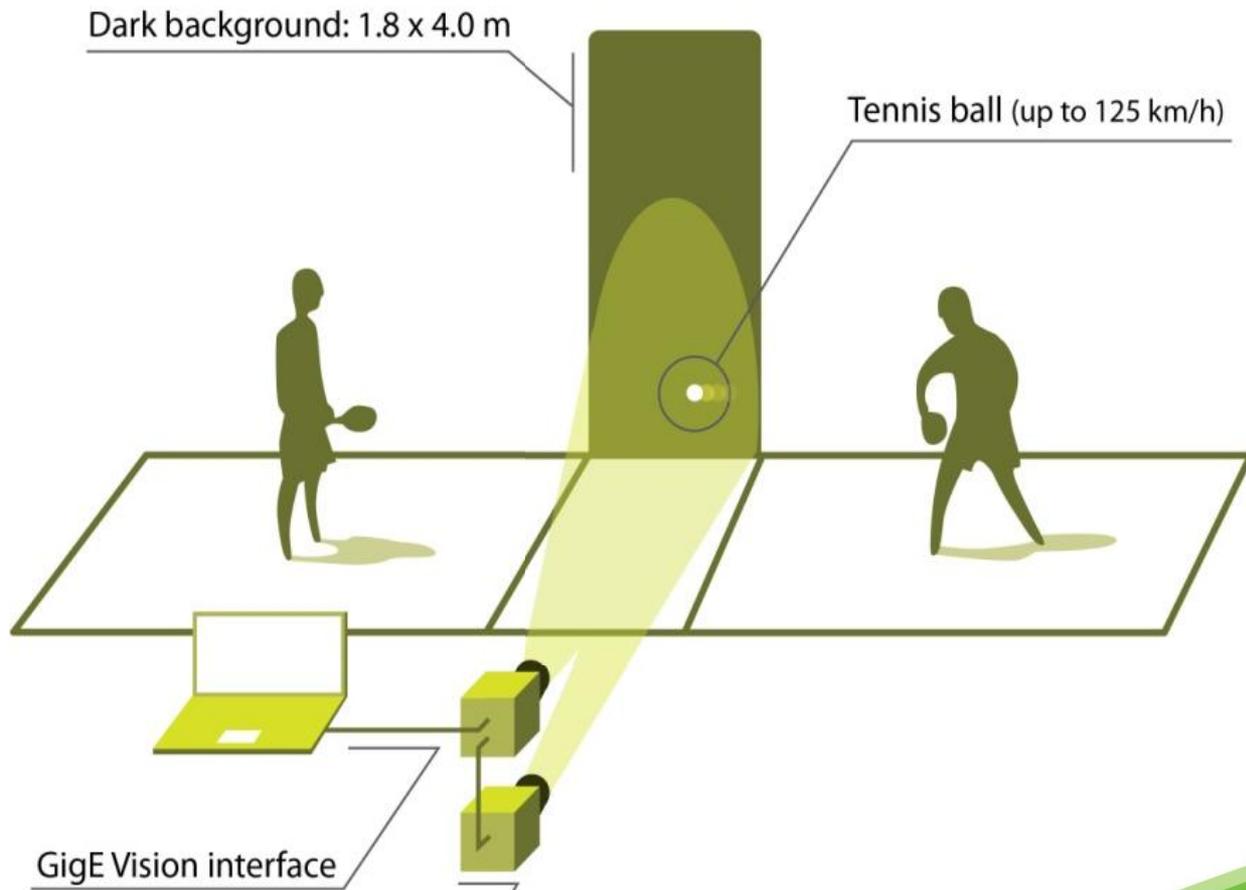
Camera positioning

Two cameras are positioned in a vertical axis opposite a dark background that improves clarity during ball traversals.

System Interface

Beach Racket, the sport

- Beach Racket has well defined rules
  - Teams of 2 or 4 players
  - Game duration: 10 or 20 min
  - Ball throws with velocities exceeding a pre-set threshold (base velocity e.g., 70 km/h) advance the team's score
  - Ball falls reduce team's score (penalties)
  - Timeouts are allowed
  - The team with the highest score wins the tournament

- The Hellenic Association for Beach Racket (HABR) is responsible for organizing the tournaments and provided the requirements for the system design
- Hundreds of players all around Greece participate in very popular tournaments

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Beach Racket, the sport

- In 2011 HABR organized the first official league, with 6 tournaments in 4 different locations in Greece
- Very high interest from all stakeholders: players, sponsors, spectators
- Some short videos can be found here and here
- HABR Web site: www.psax.gr (in Greek)

- http://www.facebook.com/BeachRacket2011

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Highlights