

Final presentation SmartServe Ball

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Video

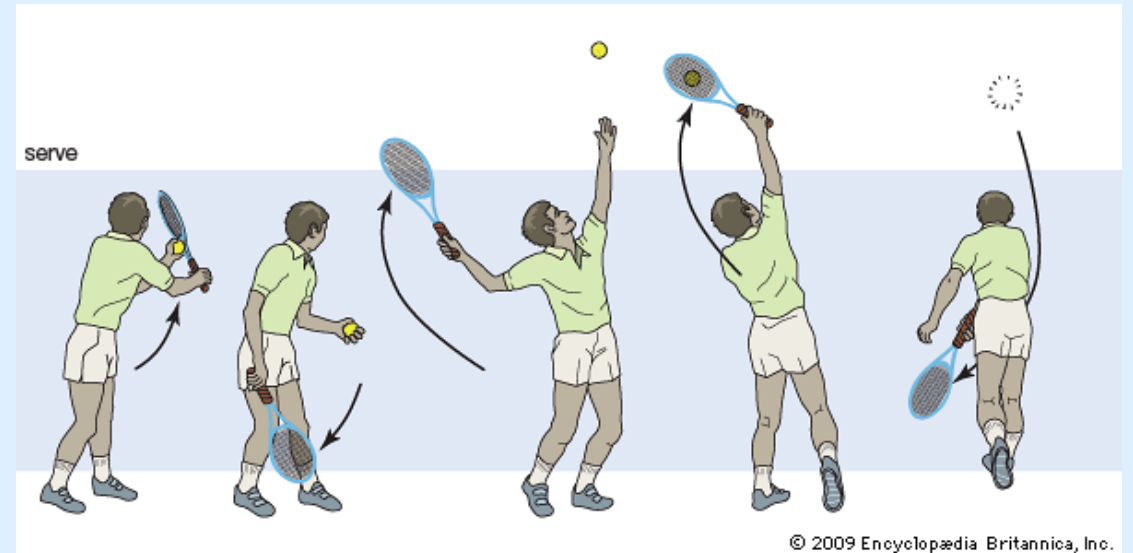
SmartServe Ball



This is the SmartServe Ball.
It looks like a simple ball,

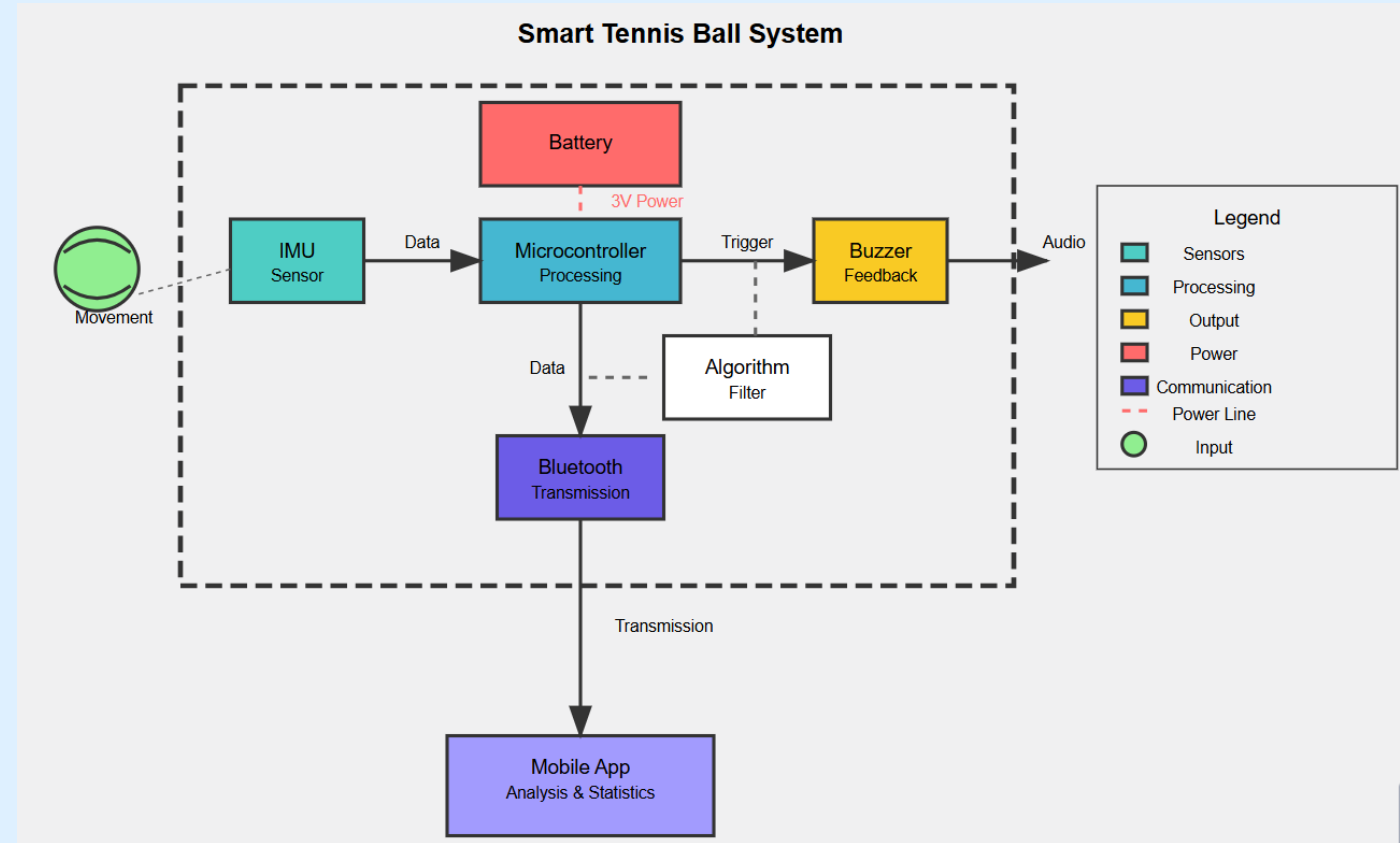
Problem Statement

- Difficult evaluation of tennis serve timing
- Alternative solutions:
 - Coach → unreliable
 - Video analysis → expensive setup



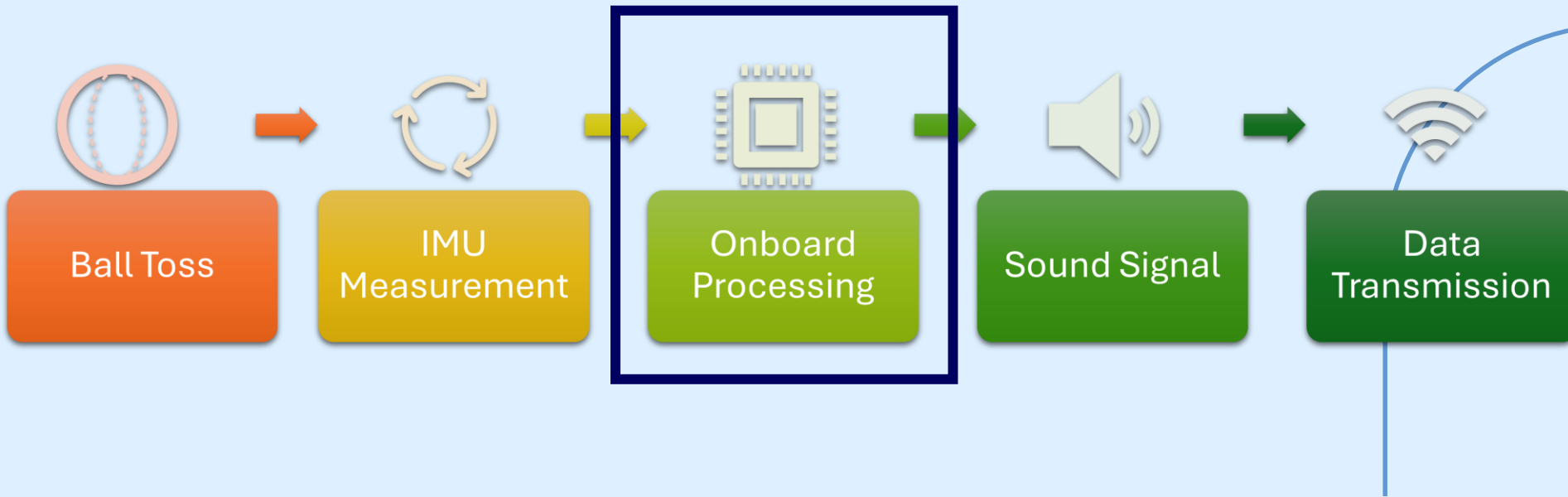
Technical design

- Seeed Studio XIAO nRF52840 Sense board
 - IMU
 - Microcontroller
 - Bluetooth module
- Integrated electrical circuit with buzzer and coin battery
- Training foam ball

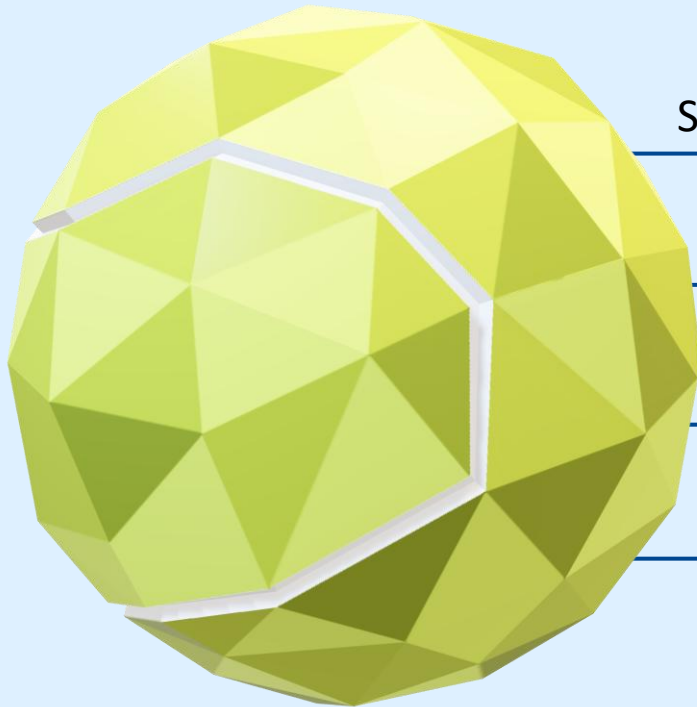


Technical design

- Velocity reconstruction from acceleration
- Freefall detection: flight time
- Apex detection → trigger acoustic feedback



User Interaction



Simple Setup

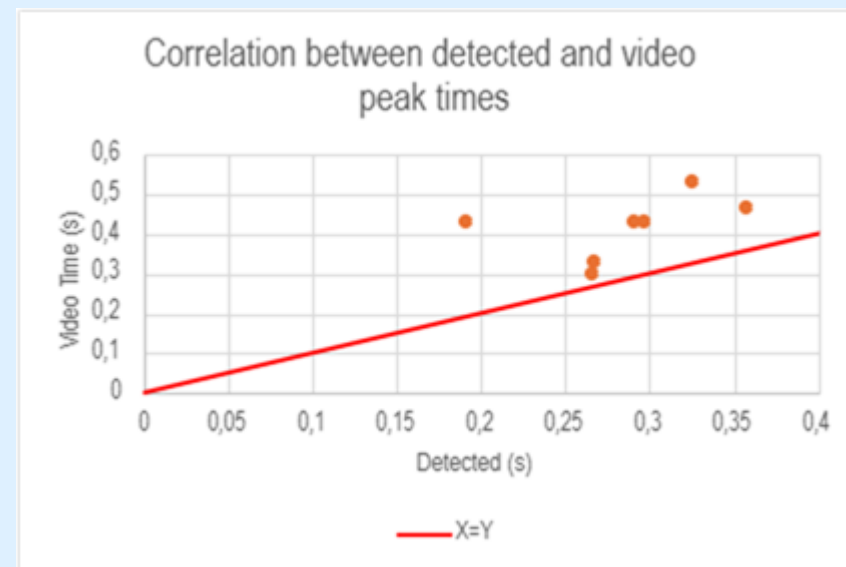
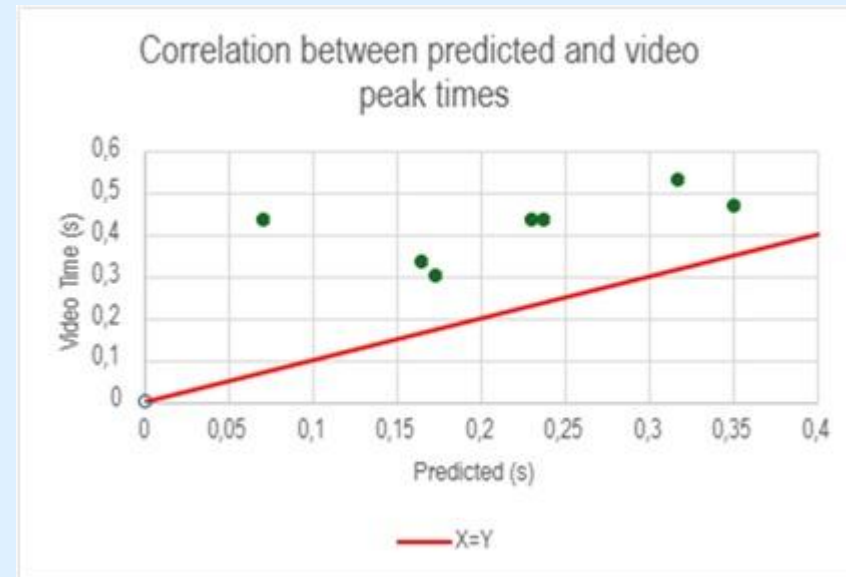
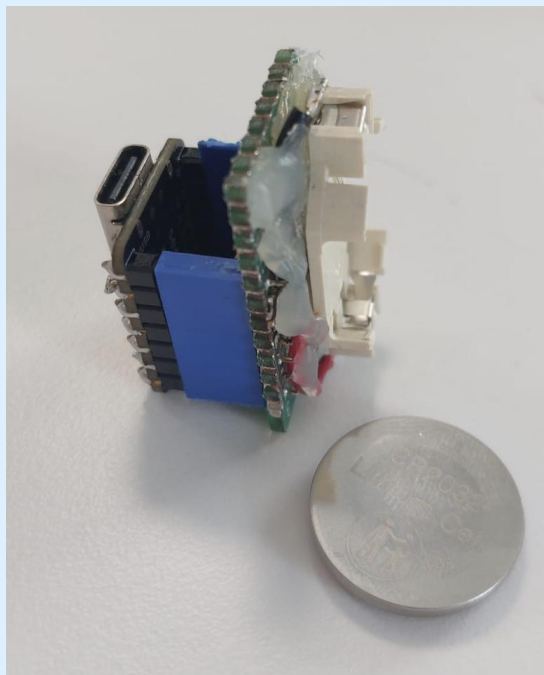
Real Time Feedback

Reduce training costs

Progress tracking

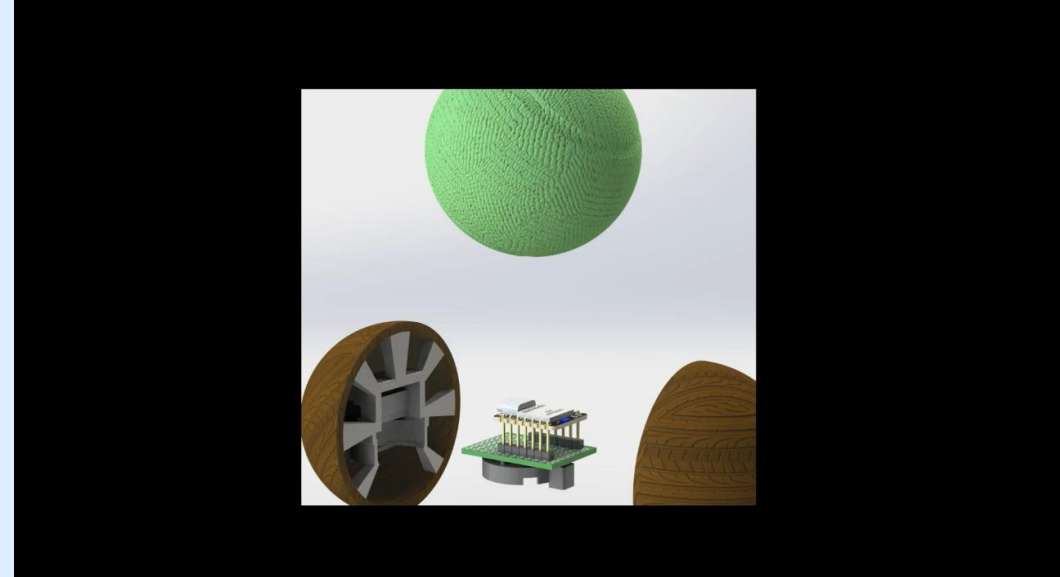
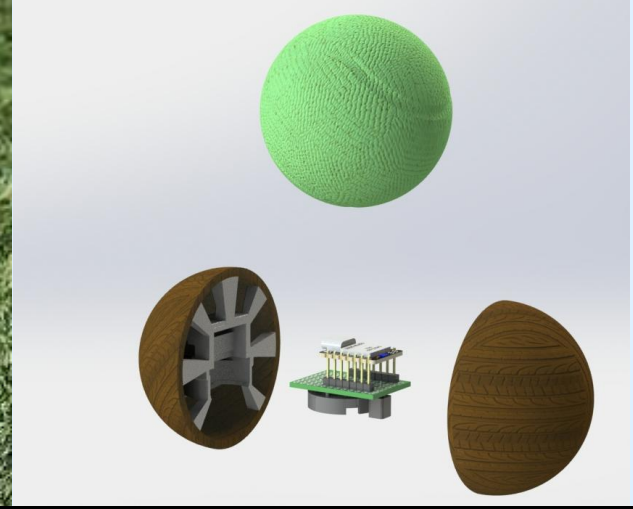
Results

- Prototype works
 - Bluetooth streaming
 - Buzzer
- Mean error (based on 7 test throws)
 - Predicted vs Video:- 47.7% (-0.19 seconds)
 - Detected vs Video:-30.5% (-0.13 seconds)
- Higher throws are better

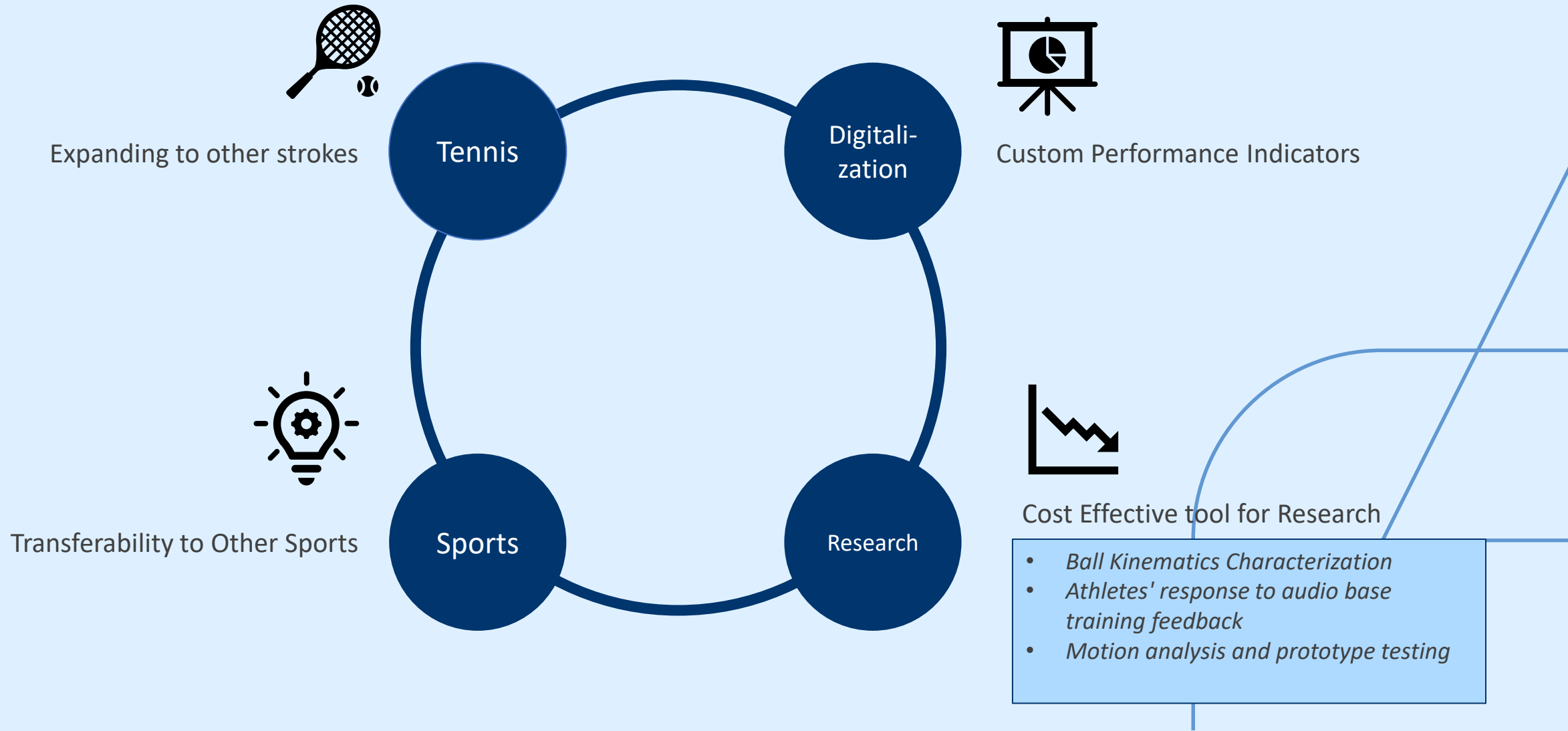


What's next

- Integration into a real tennis ball
 - Provide sufficient integrity
 - Center of rotation
 - Affect minimal initial properties
 - Weight
 - Balance
 - Elasticity
- Improve accuracy
 - Both detection and video validation
- Onboard data storage → delayed transmission
- App design for progress tracking



Other Uses



Project Methodology

The group dynamic is centered around an open table discussion.

- Brainstorming
- Collectively discuss ideas
- Parallel work

Positive

- Weekly meetings
- Strong communication

Lessons learned

- More communication between members about their work
- Seeking help at an earlier stage when stuck