

A white robotic arm with a paddle is shown in a dark environment, hitting a white ball. The robot has a simple face with two curved lines for eyes and a small circular opening for a mouth. The background is dark with some blurred lights.

AI-Driven Table Tennis Robot Calibration for Improved Gameplay

Optimizing table tennis robot performance using computer vision and AI-based calibration to deliver professional-grade accuracy and training.

Overview

Developed an AI-driven calibration mechanism that maps robot hardware characteristics to mathematical models using computer vision and data science.

- Implemented a dual-stage optimization process covering factory-level fine-tuning and user-end mobile app calibration.
- Achieved superior trajectory control and spin accuracy, leading to increased user engagement and higher training effectiveness for athletes.



Client Profile

A world-renowned German sports equipment manufacturer with a global presence, known for sponsoring professional clubs and Olympic athletes. They specialize in high-performance gear and are pioneers in integrating technology with physical sports equipment.

Challenges: Maintaining Precision in the Field and Performance Drift

Mechanical wear and tear of machine parts led to a decline in ball-placement accuracy over time.

- **Environmental Factors:** Discrepancies in table dimensions and faulty user installations created inconsistent gameplay experiences.
- **Logistical Impact:** Precision alignment was frequently compromised during international shipping and handling.

QBurst Solution: Smart Calibration Framework

We introduced a high-precision calibration ecosystem that ensures the robot maintains "factory-fresh" performance throughout its lifecycle. The solution leverages Computer Vision and AI to bridge the gap between digital configurations and physical outputs.

- **AI-Driven Machine Modeling:** Coded the robot's physical characteristics into mathematical equations, using AI to derive the "backbone" of the calibration process.
- **Production-Site Fine-Tuning:** Captured detailed output variables like motor RPM and voltage to eliminate deviations before the product leaves the factory.
- **User-Centric Mobile Calibration:** Created a repeatable process within the mobile app that allows end-users to correct alignment and drift via reverse mapping.

Technical Highlights

Computer Vision Integration: Used for data collection and processing to identify preset output deviations.

- **Custom iOS/Android Apps:** Developed specialized camera applications to facilitate the calibration data cycle.
- **Drift Management:** Features logic to handle long-term mechanical changes, ensuring repeatable accuracy.
- **Comprehensive Shot Calibration:** Tailored calibration settings for diverse table tennis parameters including spin, speed, and frequency.

Impact

The solution enhanced gameplay by delivering significant improvements in trajectory control, ball frequency, and spin consistency.

- **Increased User Satisfaction:** Simplified the onboarding process and provided users with professional-grade training reliability.

- **Training Effectiveness:** Bolstered the quality of pre-programmed drills, leading to higher athlete engagement in lesson plans.
- **Repeatability:** Empowered users to maintain their own hardware easily, reducing the need for manual support or repairs.