Swim Meet Timing

Introduction
Many recreational swim teams, such as at the Salt Lake Jewish Community Center (JCC), currently use stopwatches and paper to record all of their swim meet timing data. This requires excessive time after the meet is complete to compile the data into software used to manage the team during a season.

The use of stopwatches for manual, hand timing also introduces error into the meet data. These include missed starts, finishes, and inaccurate final times. While automated electronic systems for swim meet timing exist, they are prohibitively expensive for smaller recreational swim teams.

Goal
Cutdown after meet work time by creating a simpler, automated timing system which accomplishes:
- Eliminating missed starts
- Avoids excessive paperwork
- Allows for live adjustments to heat & lane assignments

System Description

Hardware
- 6 - 8 timers communicating with a central receiver attached to user’s PC.
- Each timer is built around an Arduino Nano microcontroller.
- Utilizes nRF24L01+ RF modules for wireless communication.

Wireless Communication
- Receiver broadcasts a signal to multiple devices assigned to same address.
- Upon race completion, each timer sends a unique ID (Lane Number), followed by the final time.
- Timer broadcasts time until receipt is acknowledged by receiving unit.

Software
- Written in Python, GUI uses PyQt5.
- Serial Communications controlled via ‘arduino’ object initialized with ‘pyserial’ library.
- Interfaces with attached Receiving Unit (Arduino Mega wired with paired RF module).
- Triggers signal to start times on all timers simultaneously (no missed starts).
- Processes signals and record data for each event/heat/lane.

Testing

- Tied time capability:
  - Two timers were stopped at the exact same time (to the 100th place). Both times were successfully received.
  - In the event that the computer doesn’t receive the time on the first attempt the timer is programmed to continue sending until a confirmation signal is received.

- Range:
  - Timer & Receiver were separated until signal was lost. Then brought back together until reliable connection was re-established.

- Comms Latency:
  - Basic code was tested between a timer and receiver to determine latency. As time will be recorded locally on timers a one-way latency of 2 ms is achieved.

Reliability
- Each timer successfully received start signal and sent time 100 out of 100 tests.

Conclusions

- System can fulfill the desired timing requirements. Meet adjustments will be made using the Meet Manager software currently used by the JCC.
- Paperwork will not be eliminated entirely as swim meets require a backup timing system to accompany the automated system.
- All desired critical specifications are accounted for by designed system.

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