Automatic Tracking of Actors with Intelligent Theatrical Lighting Systems

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Introduction:

- This Project was inspired by the need of automated spotlight control in Story Theater Company in Ames since the current spotlight control is manually handled which is more costly and prone to human errors.

- We created a solution using an indoor tracking system that transmits the actor location on stage in real time to a controller that then translates the location coordinates into direction for the spotlight to follow.

Design Requirments:

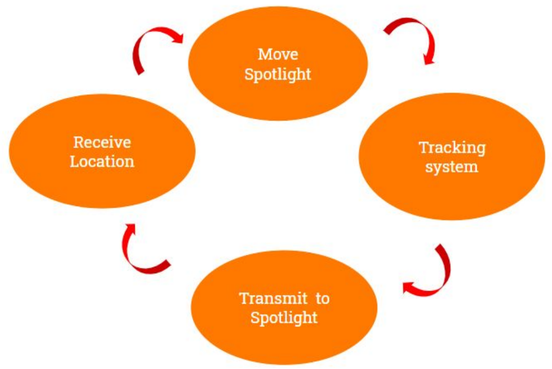
- **Functional Requirements:**
  - System supports automatic tracking with one spotlight.
  - System supports tracking an actor assuming a fixed starting location for the actor.
  - Delay between actor movement and light movement is less than one second.
  - System supports a rectangular, two-dimensional playing space.

- **Nonfunctional Requirements:**
  - System must be designed as an add-on to existing hardware.
  - System should be low cost(less than $500 fixed cost).
  - System should be designed such that it could be integrated with typical theatrical lighting software in the future.

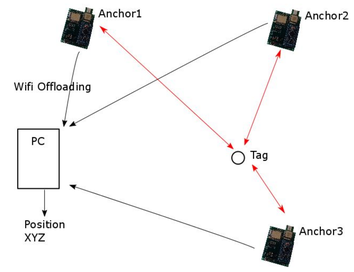
- **Operating Environment**
  The system is design to work in Story Theater Company, but could be adjusted to work at any given stage.

Design Approach:

- **Main Modules**
  - Localino tracking system
  - Python controller + OLA
  - DMX Spotlight



- **Localino System**
  - Should gets the position of the actor holding the tag PCB
  - Translates the position into a 3D coordinate



- **Python Controller**
  - Takes a 3D coordinate and translates it into a DMX value
  - Sends the DMX coordinates to the spotlight with OLA

- **DMX Spotlight**
  - 16 channel spotlight
  - Receives the DMX signals and points at the actor/actress

Technical Details:

- **Technology Used:**
  - Printed Circuit Boards
  - DMX Spotlight
  - Soldering Iron

- **Software Modules:**
  - Localino software
  - Python
  - Open Lighting Architecture
  - Wireshark

Testing:

- **Testing Environment:**
  - Carver Theater Room (Carver 308)
  - The system was not tested in Story Theater Company due to COVID-19

- **Testing Strategy:**
  - Get the coordinates of the receiving PCB.
  - Use three anchor PCBs to allocate the position of the actor, holding this receiving PCB.

Engineering Standards and Design Practices:

- J-STD-016-1995 - Standard for Information Technology--Software Life Cycle Processes--Software Development--Acquirer-Supplier Agreement
- American National Standard For Evaluation of Wireless Coexistence