

Project Sauron

Preliminary Design Review

Senior Design Project

Fall 2015



Meet The Team



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Goal

Develop a real-time recording system to localize and track targets in a noisy environment and output clear audio and video.



Current Solutions?

Video Surveillance

- Non-Directional Noisy Audio
- Data intensive

Phone Tapping

- Need to breach carrier network
- No/Minimal visual

Directional Microphone

- Track one at a time
- No visual



Our Solution: Sauron

- Input video feed
- Arbitrarily distributed mics
 - Requires calibration
- Target tracking and AV recording
- Parallel recording of multiple targets
- Speech to text

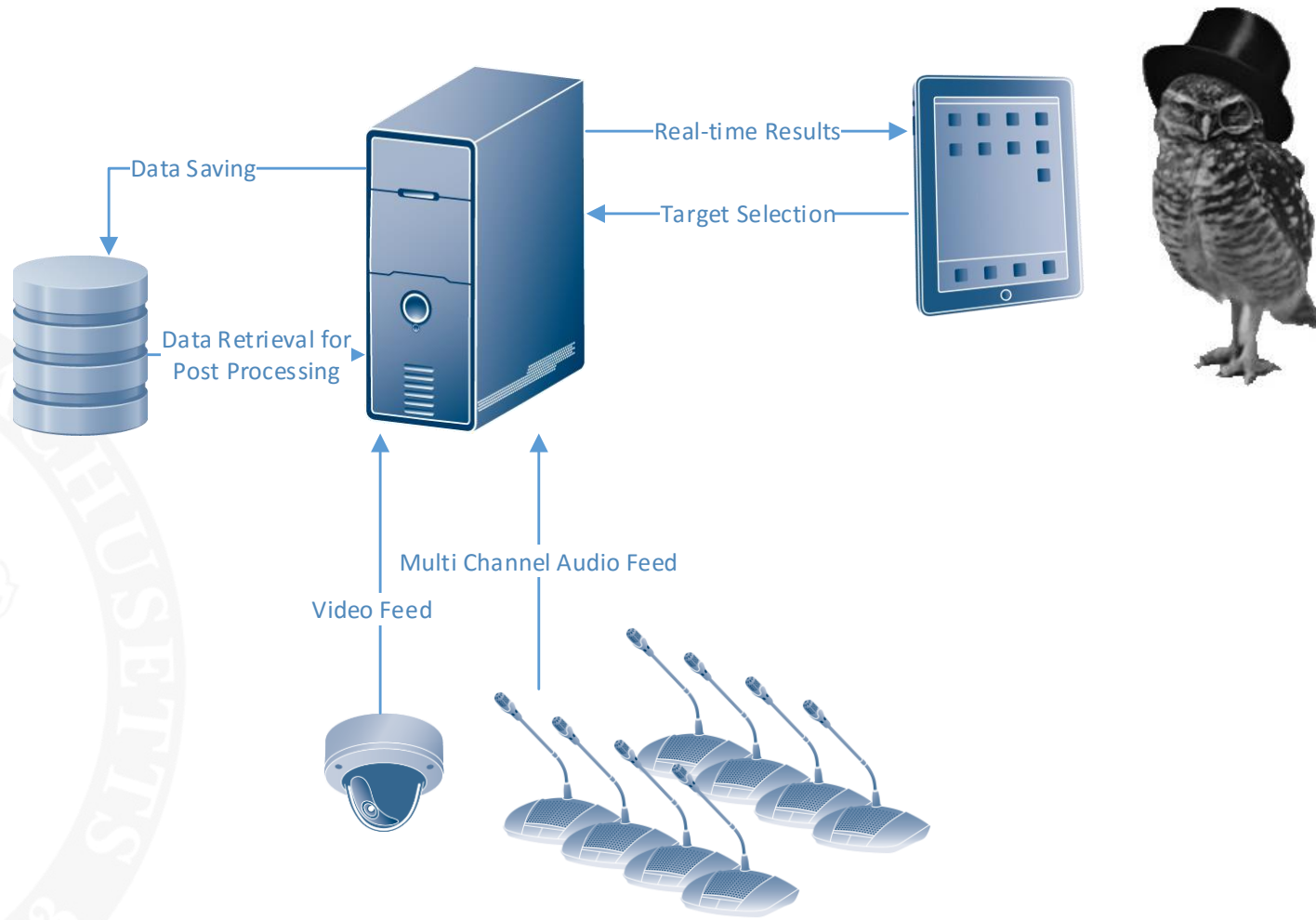
Who cares

- Government
 - Homeland security
 - Law Enforcement
 - Forensics
- Corporate
 - Facility security
- Residential areas

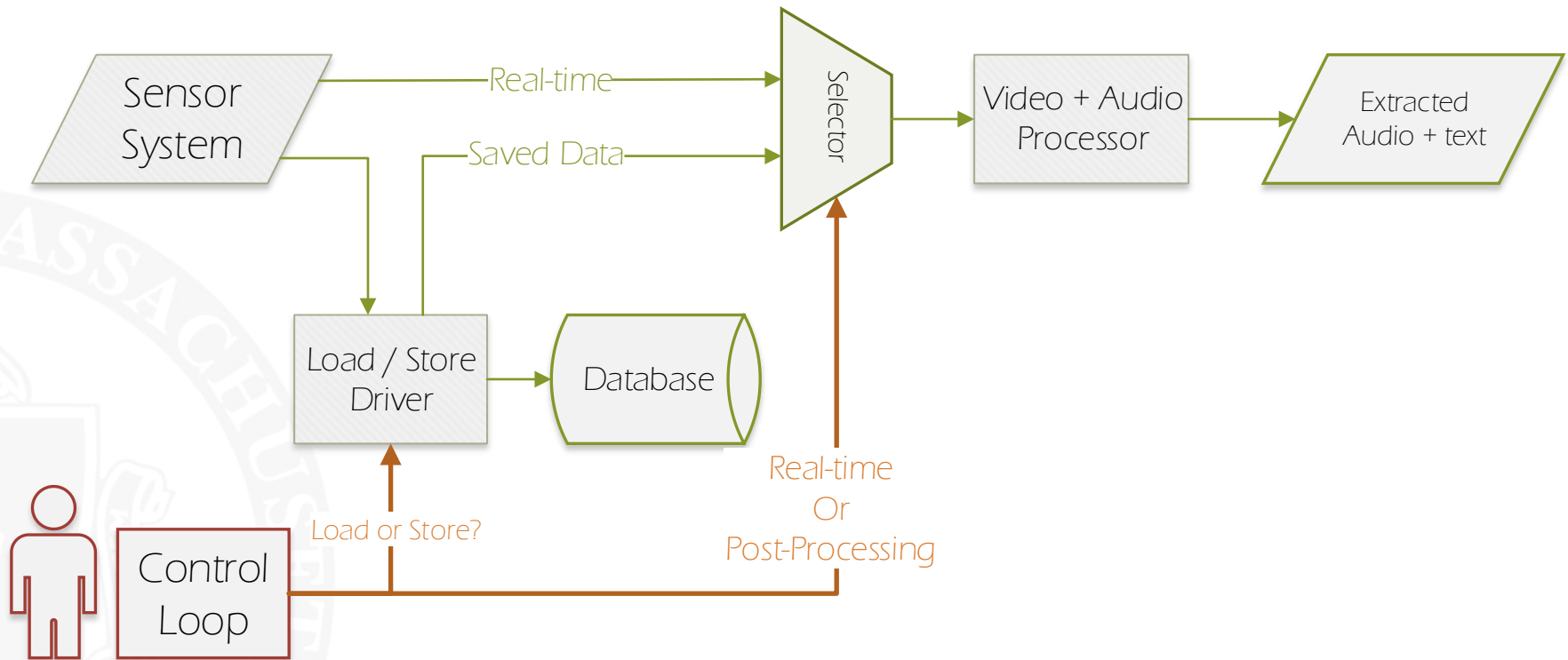
System Requirements

- Operate within human voice frequency spectrum
 - 80Hz - 3kHz (Necessitates 6kHz sampling frequency)
- Adapt to arbitrary Microphone Distribution
 - Microphone Distribution must operate in the Guinness Student Center
- Real-time
 - Video (30 frames per second)
 - Position updates (12 updates per second)
 - Video, audio, and transcript must be accurate within 5 seconds.
- Accurate
 - Visually flag target within a meter
 - Must be able to isolate audio within a cubic foot

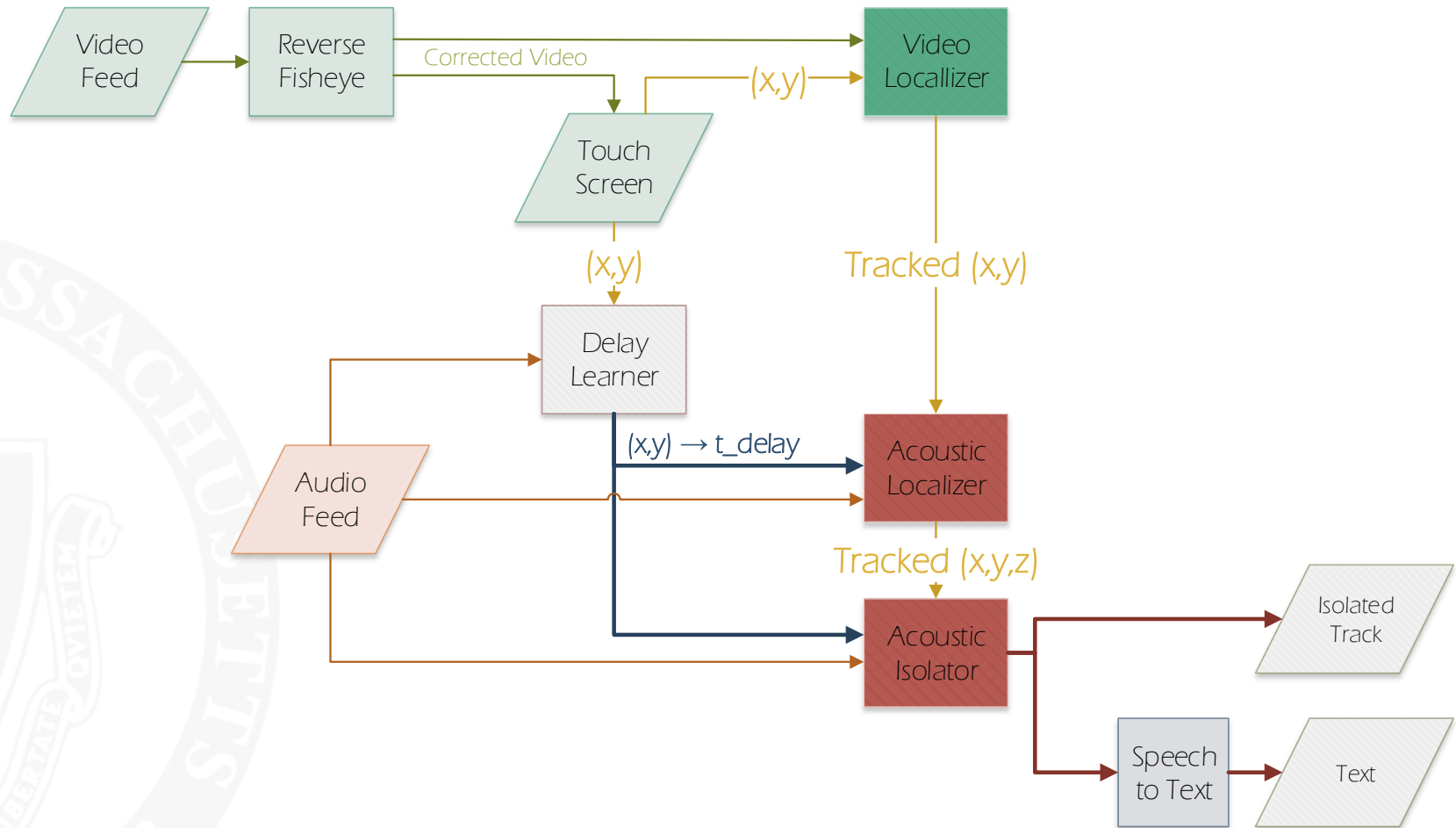
System Overview



Block Diagram - High Level



Block Diagram



Processor Algorithm

1. User selects target from video input
2. Obtain visual description of target
3. Repeat:
 1. Find region in video where target could be
 2. Map visual coordinates to delay differences
 3. Find loudest human voice near delay differences
 4. Isolate sound source and highlight the detected target
 5. Audio to Text

Risks vs. Payoffs

Risk:

Unethical applications

Limited audio and video coverage

Hard to conceal

Payoff:

Easy identification of individuals for user

Arbitrary setup

Cost

Item	Quantity	Unit Cost	Total Cost
Microphone	8	\$30	\$240
Audio Amplifier	8	\$5	\$40
8-channel Receiver (ADC)	1	\$100	\$100
Digital Fish-Eye Camera	1	\$100	\$100
Computer	1	N/A	N/A
Software (Matlab, Labview)	N/A	N/A	N/A
Total			\$480

MDR Deliverables

- Reproduce Acoustic Beamformer Functionality
 - Establish Hardware Setup
 - Microphone to ADC
 - Establish Interface
 - Microphone Input into MATLAB
 - Be able to analyze 8 channels in MATLAB
- Development of real-time software framework
- Video input into MATLAB