The background is a dark, moody photograph of a road at night. Bare trees stand silhouetted against a dark sky. In the lower-left foreground, the headlights of a car illuminate the road ahead, casting long shadows. The overall atmosphere is mysterious and focused on the theme of night driving.

# HARDWARE IMPLEMENTATION OF CURVATURE - ADAPTIVE HEADLIGHT SYSTEM



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"ILLUMINATE SMARTER, DRIVE SAFER."



# PROBLEM STATEMENT

- Fixed headlights do not adjust to road curves.
- Leads to blind spots, delayed reaction time.
- Major cause of night-time accidents on turns.



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# Quantitative Data:

- 25% of fatal crashes occur on horizontal curves.
- Risk of crashing is 4x higher on curves at night.
- Up to 40% of road edge is unlit by fixed headlights.
- Lateral visibility can drop by 60–70% in moderate curves.
- Driver reaction time decreases by ~0.5 seconds without adaptive lighting.



"ILLUMINATE SMARTER, DRIVE SAFER." A small yellow lightbulb icon with a blue base, positioned next to the slogan.

# Objective

- To detect lane curvature using computer vision.
- To implement Real-time adjustment of headlights with servo motors.
- To propose an affordable, compact, and reliable system.
- To improve lowlight visibility and reduce curve-related crashes.

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# PROCESS FLOW

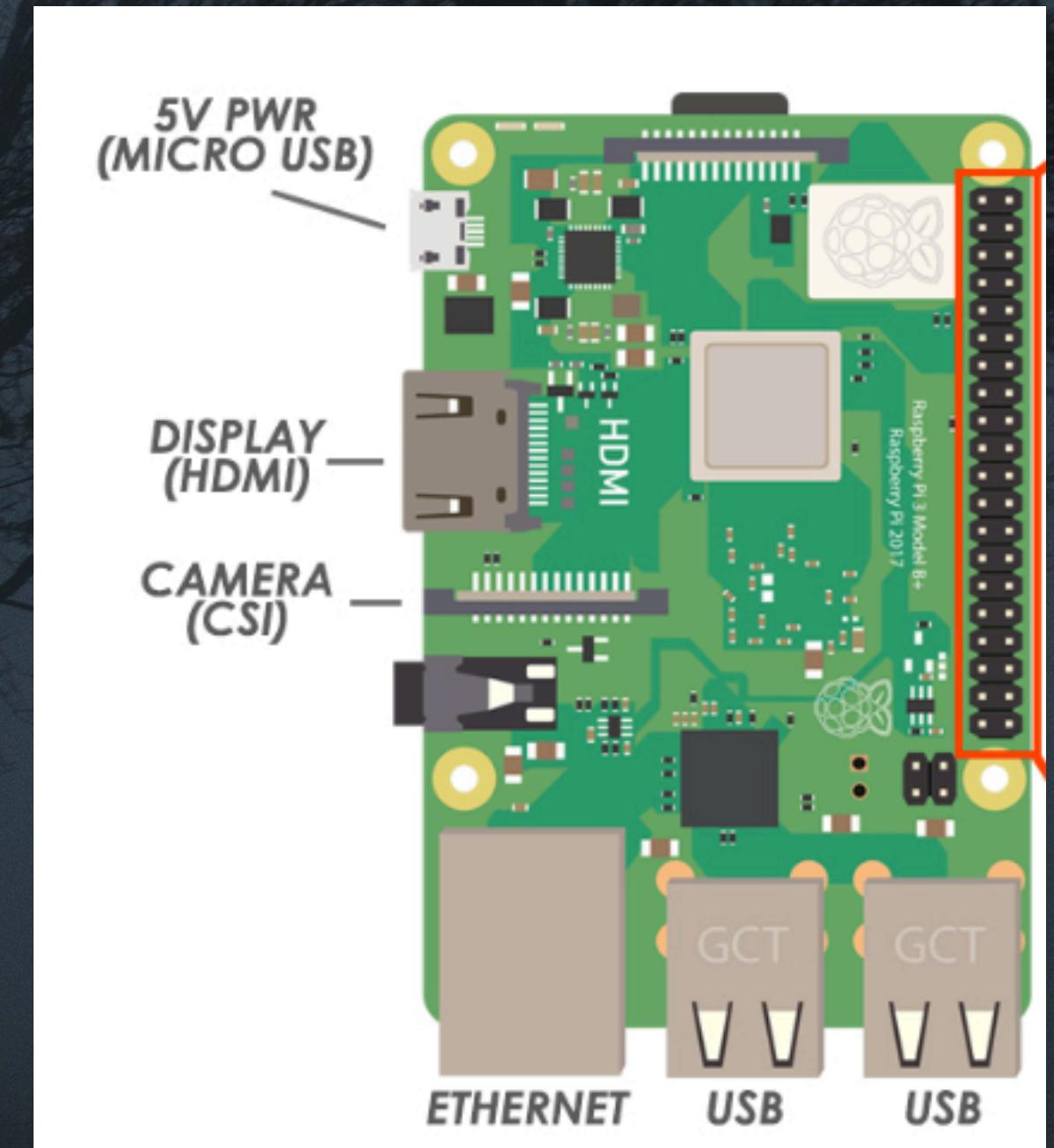




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# Hardware Used

- Raspberry Pi 5
- IP Webcam
- 2x SG90 Servo Motors
- High-brightness LEDs
- Toy car chassis, jumper wires



# Results & Verification

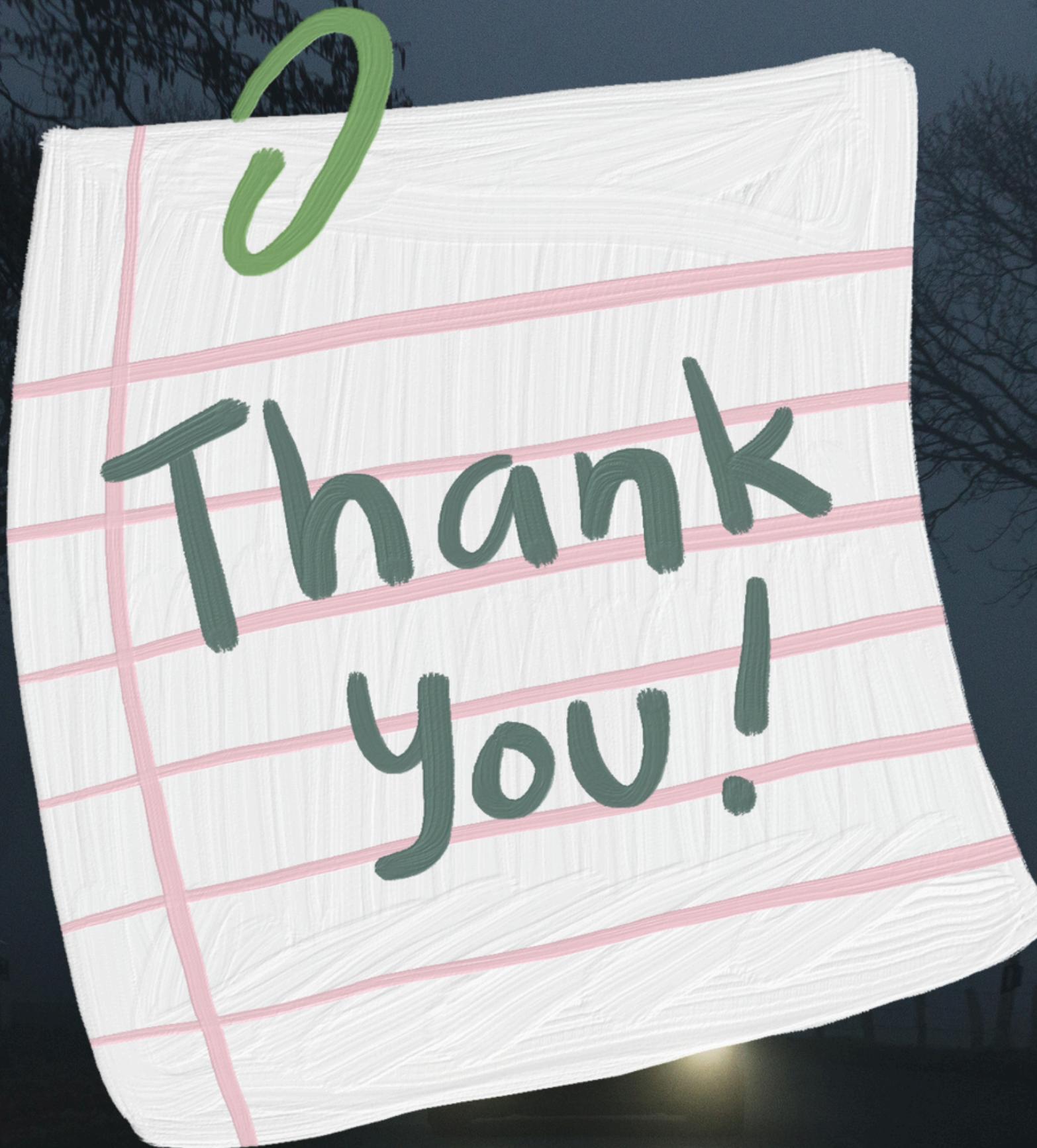
- Response Time: 100 to 130 ms
- Visibility Increase: more than 45% in curved road area

# Without CAHS:

- 40% of road edges remain unlit on curves.
- Reaction time delay: ~0.5 sec leads to 3-4 meters longer braking distance.
- Energy waste due to misaligned beams.

# Applications & Future Scope

- Autonomous vehicle integration
- AI -based curve prediction
- Adaptive beam width based on speed



Demo Invite

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