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Introduction

Team 41 developed a smart thermal control system that aims to improve residential energy efficiency by dynamically adjusting window transparency based on environmental conditions





PDLC Operation

- The system intelligently controls PDLC (Polymer Dispersed Liquid Crystal) film to reduce heat gain and glare
- The solution is designed to augment HVAC systems without compromising user comfort, and to integrate into existing homes with minimal modifications.

Testing and Development



Historical weather data simulation





Electrical Engineering Capstone Design Project Spring 2025 Smart PDLC Controller

Battery capacity for typical Arizona summer day



Voltage received to the PDLC and Arduino Due









• System is adaptive to light and temperature • Sufficient power management maximize battery life while remaining flexible

Team Members:

- James Fink
- Matthew Peat
- Baraa Soqati
- Tim Schneider
- Matthew Wood Thornton

Mentor: Trevor

System Design

• Using a microcontroller, light and temperature sensors, and real-time weather data, the system intelligently controls the PDLC state to reduce heat gain and glare.

System Schematic:

Conclusion

• <u>Key Aspects</u>

- Power Management
- Control System Design
- Collaborative Teamwork