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| University of Missouri – St. Louis |
| **Beyond Fobs: A Secure QR Code-Based Access System** |
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## Abstract

In this project, I propose a secure QR code authentication system that enhances traditional authentication methods.

While QR codes are widely used for authentication, conventional systems simply attempt to match a displayed QR code to a database. In the best case, these standard QR code detection methods are simply unreliable in challenging environments such as in low-light conditions with user-induced motion blur. In the worst case, standard QR code detection methods are subject to cybersecurity threats.

To address these issues, this project integrates two key components: (1) Enhanced QR code detection using adaptive thresholding, homography transformations, and deblurring techniques to improve robustness in real-world conditions; and (2) A time-based system that ensures QR codes dynamically refresh to prevent reuse or replay.

This approach provides a secure and user-friendly authentication solution that can be deployed in various environments, offering improved protection while maintaining ease of use.

## Introduction

### Background on QR Authentication

General explanation of how QR codes are used in authentication (logging into websites, mobile payments, secure access)

### Problem Statement

What issues exist with current QR code authentication methods?

* Low-light
* Motion blur
* Sharing a QR code

### Objective

A QR code detection system that resolves issues in detection and security.

## Literature Review

### Techniques in QR-Based Authentication

What approaches have been attempted? What were the results?

### Security Vulnerabilities in QR-Based Authentication

What approaches have been attempted? What were the results?

### Time-Based Authentication with QR Codes

What approaches have been attempted? What were the results?

## Methodology and Implementation

### System Overview

High level description of the approach with a flowchart.

### Technologies Used

What were all the technologies used?

### Enhanced QR Code Detection

#### Adaptive Thresholding

Text here.

#### Homography Transformations

Text here.

#### Deblurring Techniques

Text here.

### Time-Based QR Code Refresh System

Talk about the implementation of dynamic QR codes that prevent reuse or replay.

### Challenges and Solutions

What sorts of issues arose and how were they solved?

## Experimental Results and Evaluation

### Test Setup

How did I test my system, including what dataset and parameters?

### Performance Analysis

How well did the system hold up?

### Security Analysis

How well did the system hold up?

### User Experience

How well did the system hold up?

## Discussion

How should the results be interpreted?

## Conclusion

Summary of key findings and final remarks.

## References

Citations here.