Intergalactic Riksbanken Chip Authenticator - Project Summary

Group 8

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Intergalactic Riksbanken Chip Authenticator

Project Summary

Authors: Group 8

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Course: STB600 Final Project 2025

Date: December 14, 2025

■ Project Complete!

■ *Deliverables*

■ **Source Code** - All three operating modes implemented

■ **Documentation** - Complete technical design document

■ **Screenshots** - 7 demonstration images captured

■ **User Guides** - Quick start and detailed usage instructions

■ **Design Report** - 30-page comprehensive project document

■ Project Structure

```
chip_system/                          # Main project directory
■■■ launcher.py                        # ■ Main entry point (all modes)
■■■ main.py                            # Conveyor belt simulator
■■■ camera_main.py                     # Real-time camera detection
■■■ game.py                            # Interactive manual testing
■■■ capture_screenshots.py             # Documentation utility
■
■■■ assets/                            # Chip template images
■   ■■■ gold.png                       # Gold chip with green background
■   ■■■ silver.png                     # Silver chip
■   ■■■ bronze.png                     # Bronze chip
```

```
■
■■■ docs/                              # Documentation folder
■   ■■■ images/                        # ■ Project screenshots
■   ■   ■■■ 01_empty_conveyor.png
■   ■   ■■■ 02_multiple_chips.png
■   ■   ■■■ 03_gold_chip.png
■   ■   ■■■ 04_silver_chip.png
■   ■   ■■■ 05_bronze_chip.png
■   ■   ■■■ 06_fake_chip.png
■   ■   ■■■ 07_full_simulation.png
■   ■■■ SCREENSHOTS.md                 # Screenshot documentation
■   ■■■ CAMERA_USAGE.md                # Camera system guide
■   ■■■ MIGRATION.md                   # Cleanup notes
■
■■■ README.md                          # Main documentation
■■■ DESIGN_DOCUMENT.md                 # ■ Complete technical report
■■■ QUICKSTART.md                      # Fast reference guide
■■■ CHANGELOG.md                       # Version history
■■■ COMMIT_SUMMARY.md                  # Git commit preparation
■■■ CONTRIBUTING.md                    # Contribution guidelines
■■■ LICENSE                            # MIT License
■■■ requirements.txt                   # Python dependencies
■■■ .gitignore                         # Git ignore rules
```

■ Three Operating Modes

1. Simulator Mode (`python main.py`)

• Conveyor belt with automatic chip spawning

• 60 FPS real-time simulation

• Perfect for algorithm testing

2. Camera Mode (`python camera_main.py`)

• Interactive color calibration

• Real-time chip detection

• Supports webcam and Basler cameras

• 30+ FPS processing

3. Interactive Game (`python game.py`)

• Manual chip spawning (keys 1/2/3)

• Static display for testing

• Grid background for placement

• Instant value feedback

Unified Launcher (`python launcher.py`)

• Single entry point for all modes

• Interactive menu system

• Error handling and recovery

■ System Capabilities

Chip Authentication

• **Gold Chips**: Yellow, value = digits × 10

• **Silver Chips**: Gray, value = digits

• **Bronze Chips**: Orange, value = digits multiplied

• **Fake Chips**: Red, zero value

Technical Features

• ■ HSV color space detection

• ■ Alpha channel transparency

• ■ Real-time statistics tracking

• ■ 60 FPS simulator, 30+ FPS camera

• ■ Green background removal

• ■ Automatic value calculation

■ Screenshots Captured

All screenshots are located in `docs/images/`:

01_empty_conveyor.png - Initial state with green belt

02_multiple_chips.png - Multiple chips in motion

03_gold_chip.png - Gold chip detection

04_silver_chip.png - Silver chip detection

05_bronze_chip.png - Bronze chip detection

06_fake_chip.png - Fake chip identification

07_full_simulation.png - Complete system view

View all screenshots with descriptions in docs/SCREENSHOTS.md

■ Documentation Files

User Documentation

• **README.md** (140 lines) - Complete project overview

• **QUICKSTART.md** (50 lines) - Fast reference

• **docs/SCREENSHOTS.md** (100 lines) - Visual demonstrations

Technical Documentation

• **DESIGN_DOCUMENT.md** (700+ lines) - Complete technical design & project report

• Executive summary

• System architecture

• Algorithm descriptions

• Performance analysis

• Code structure

• Future enhancements

Development Documentation

• **docs/CAMERA_USAGE.md** (200+ lines) - Camera system guide

• **CONTRIBUTING.md** (80 lines) - Contribution guidelines

• **CHANGELOG.md** (40 lines) - Version history

• **COMMIT_SUMMARY.md** (150 lines) - Git preparation

■ Technical Stack

Component	Technology	Version
Language	Python	3.8+
Vision	OpenCV	4.8.0+
Computing	NumPy	1.24.0+

Color Space	HSV	OpenCV
Camera	Webcam/Basler	Any

■ Key Achievements

■ **Multi-Mode System**: Simulator, Camera, Game modes

■ **Real-Time Processing**: 30-60 FPS performance

■ **Adaptive Calibration**: Interactive color learning

■ **Complete Documentation**: 30+ page technical report

■ **Visual Demonstrations**: 7 professional screenshots

■ **Clean Architecture**: Modular, extensible design

■ **User-Friendly**: Intuitive controls and feedback

■ How to Run

Quick Start

```
# Navigate to project
cd chip_system

# Install dependencies
pip install -r requirements.txt

# Run launcher (recommended)
python launcher.py

# Select mode:
# 1 - Simulator
# 2 - Camera (with calibration)
# 3 - Interactive Game
```

Individual Modes

```
# Simulator only
python main.py

# Camera only
python camera_main.py
# Game only
```

```
python game.py
```

■ Project Report

The complete technical design document is available in:

■ DESIGN_DOCUMENT.md

Includes:

• System architecture diagrams

• Algorithm explanations with formulas

• Performance benchmarks

• Code structure analysis

• Testing & validation results

• Future enhancement roadmap

■ Group 8 Members

Name	Role	Contributions
Suneela	Team Member	System development
Sara	Team Member	System development
Abhishek	Team Member	System development

■ License

■ Project Status: COMPLETE ■

All deliverables completed:

- ■ Working software (3 modes)
- ■ Technical documentation
- ■ Project screenshots
- ■ User guides
- ■ Design report
- ■ Source code organization
- ■ Ready for submission

Intergalactic Riksbanken Chip Authenticator

Authenticating the future, one chip at a time ■

STB600 Final Project 2025

Group 8: Suneela, Sara, Abhishek