



# Smart Sorting System

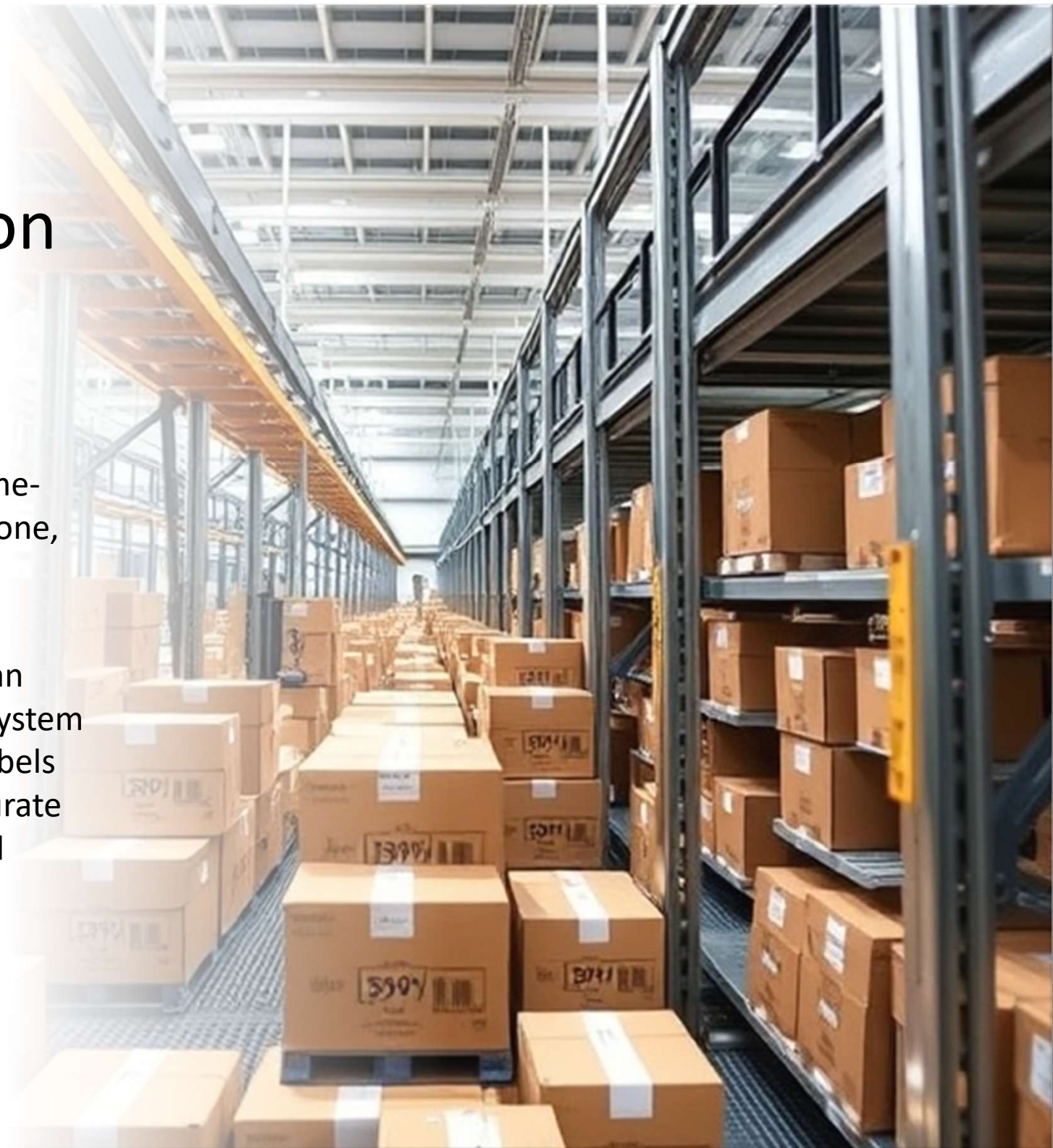
Presented By: Ahmad Saadeh & Ahmed Awwad

Advisor: Dr. Hikmat Darawsheh

Date: January 2025

# Introduction

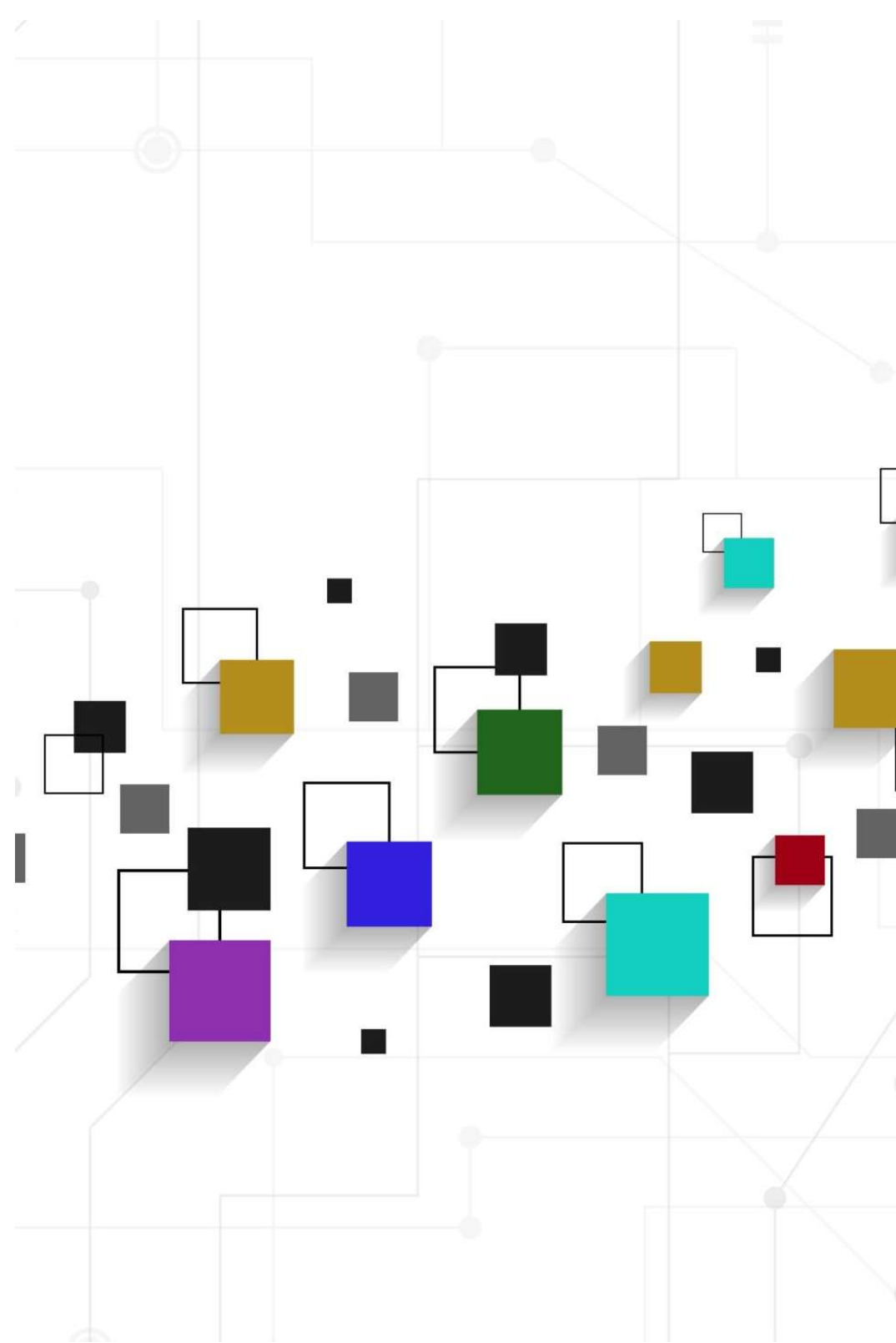
- Problem Statement: Manual sorting is time-consuming, error-prone, and costly.
- Objective: Develop an automated sorting system using color-coded labels for faster, more accurate sorting with minimal human intervention.



# System Overview

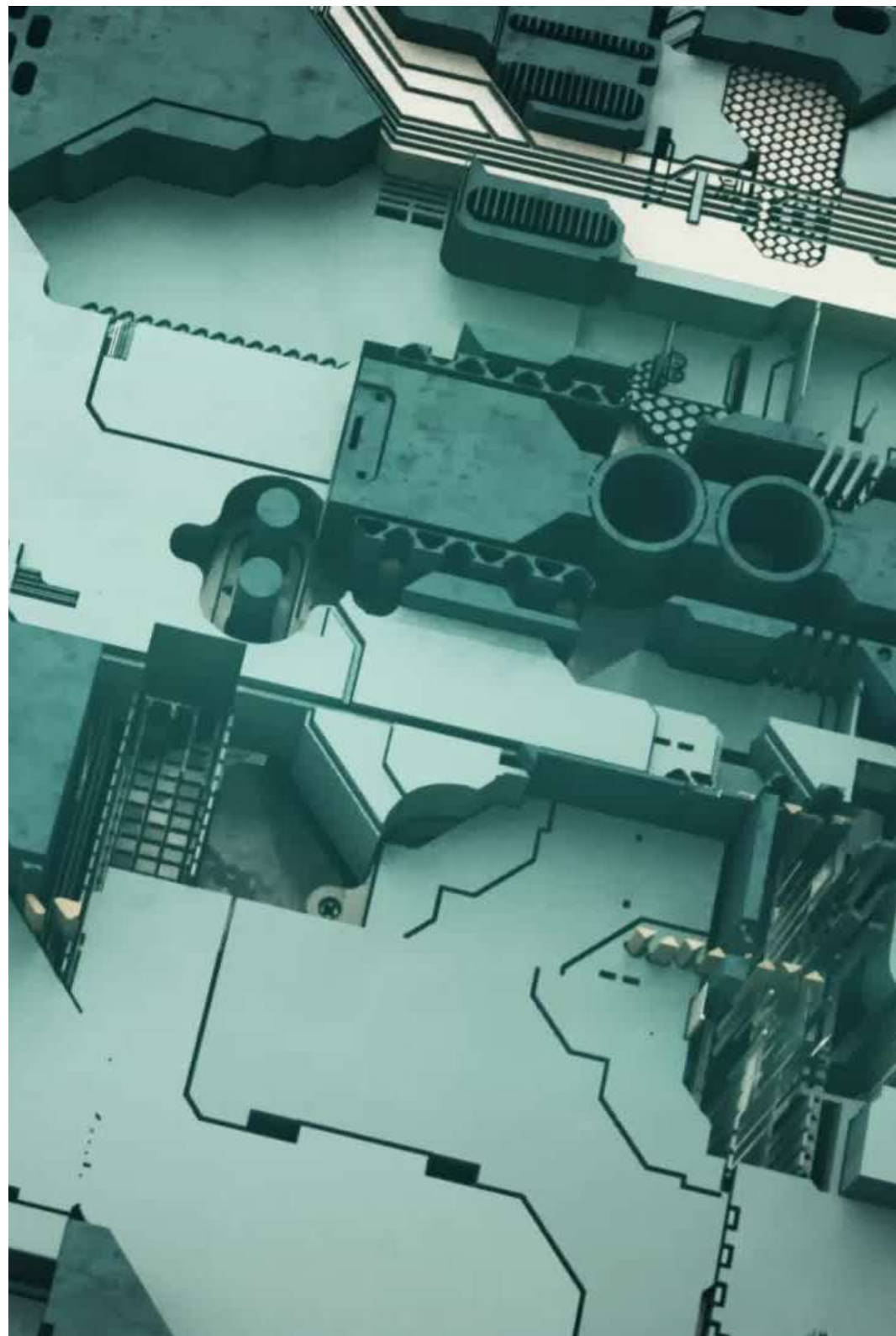
## Core Features:

- Hardware and software integration for efficient sorting.
- Color-based item classification.
- Real-time data synchronization and monitoring through a web interface.



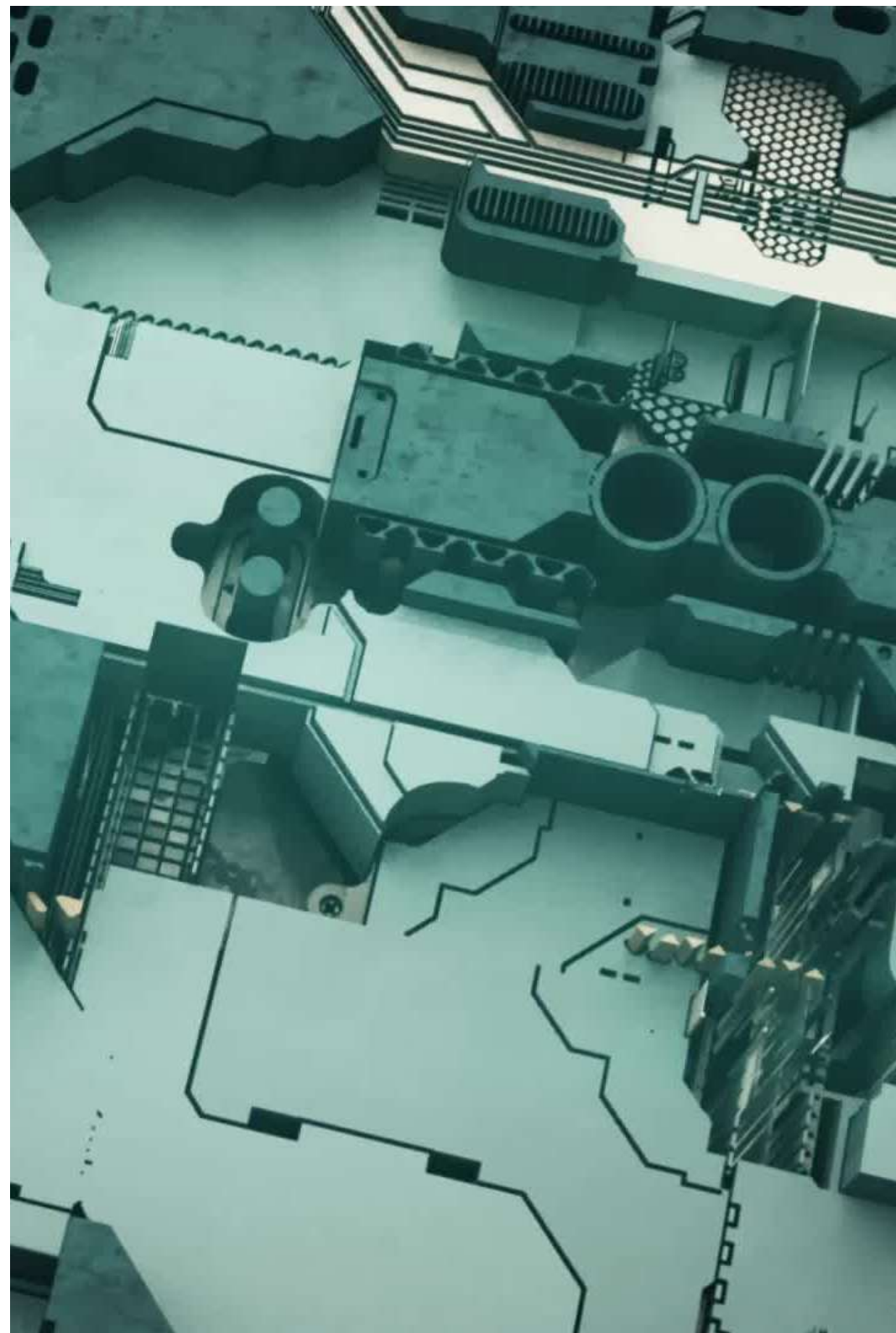
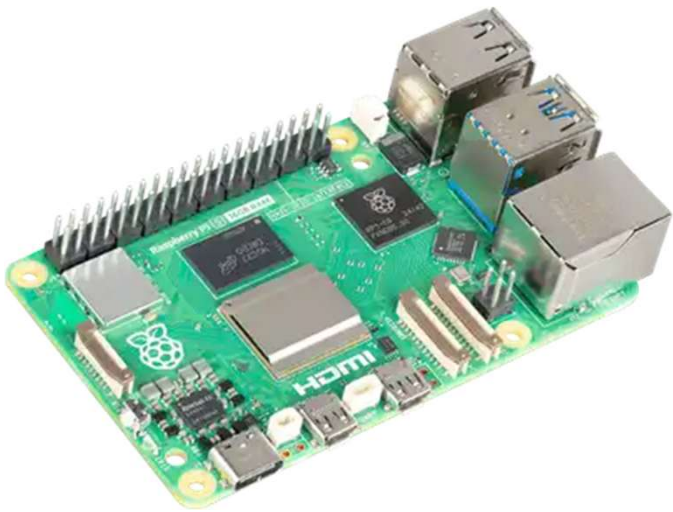
# Hardware Components

Luxonis OAK-D Camera: Color detection.



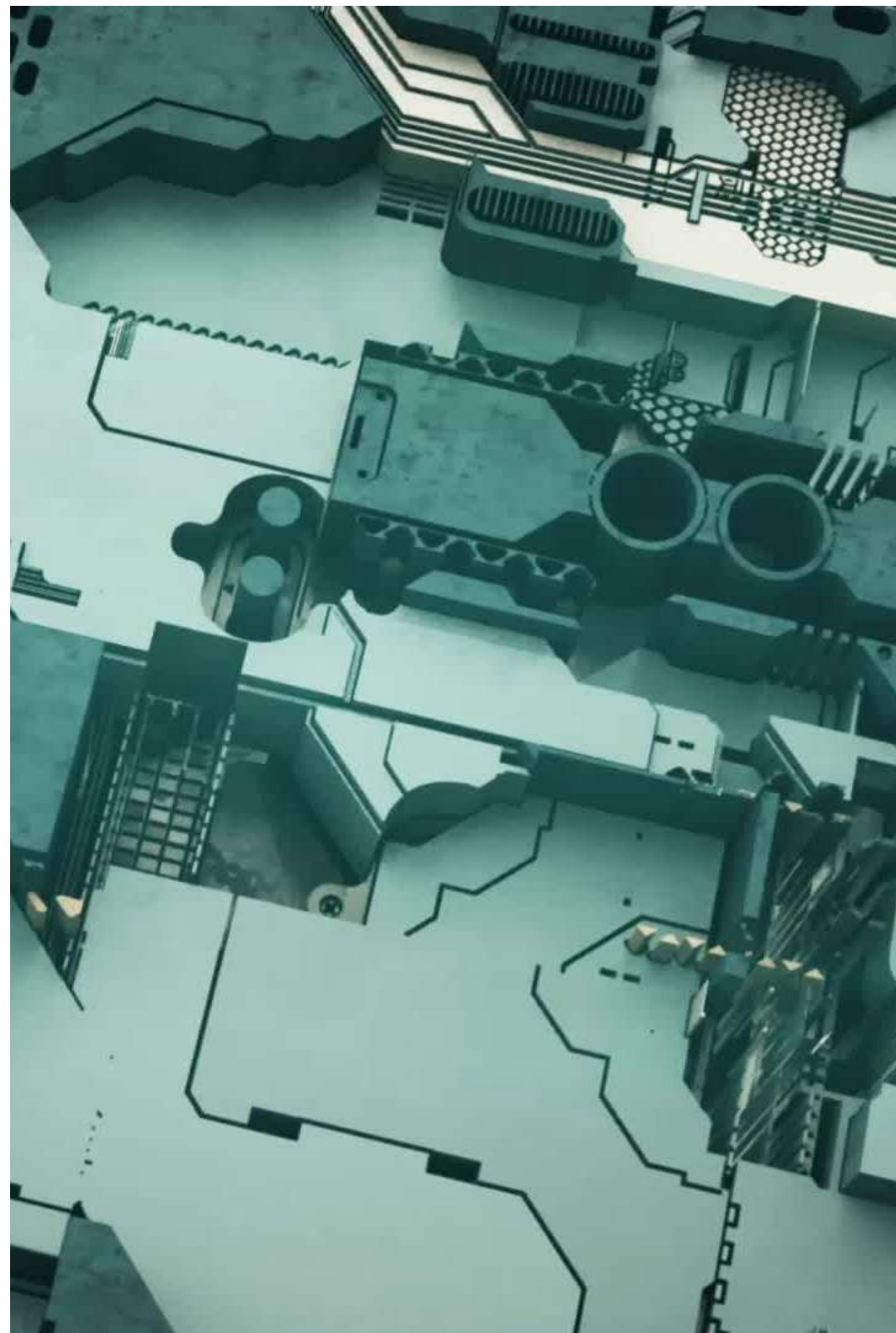
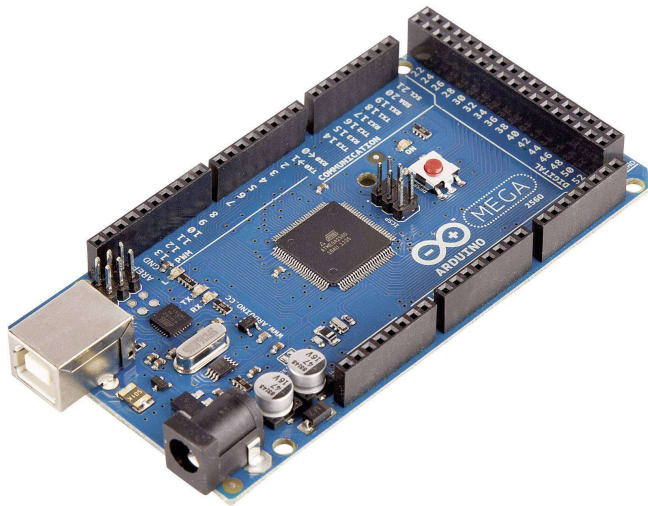
# Hardware Components

Raspberry Pi 5: Main processor.



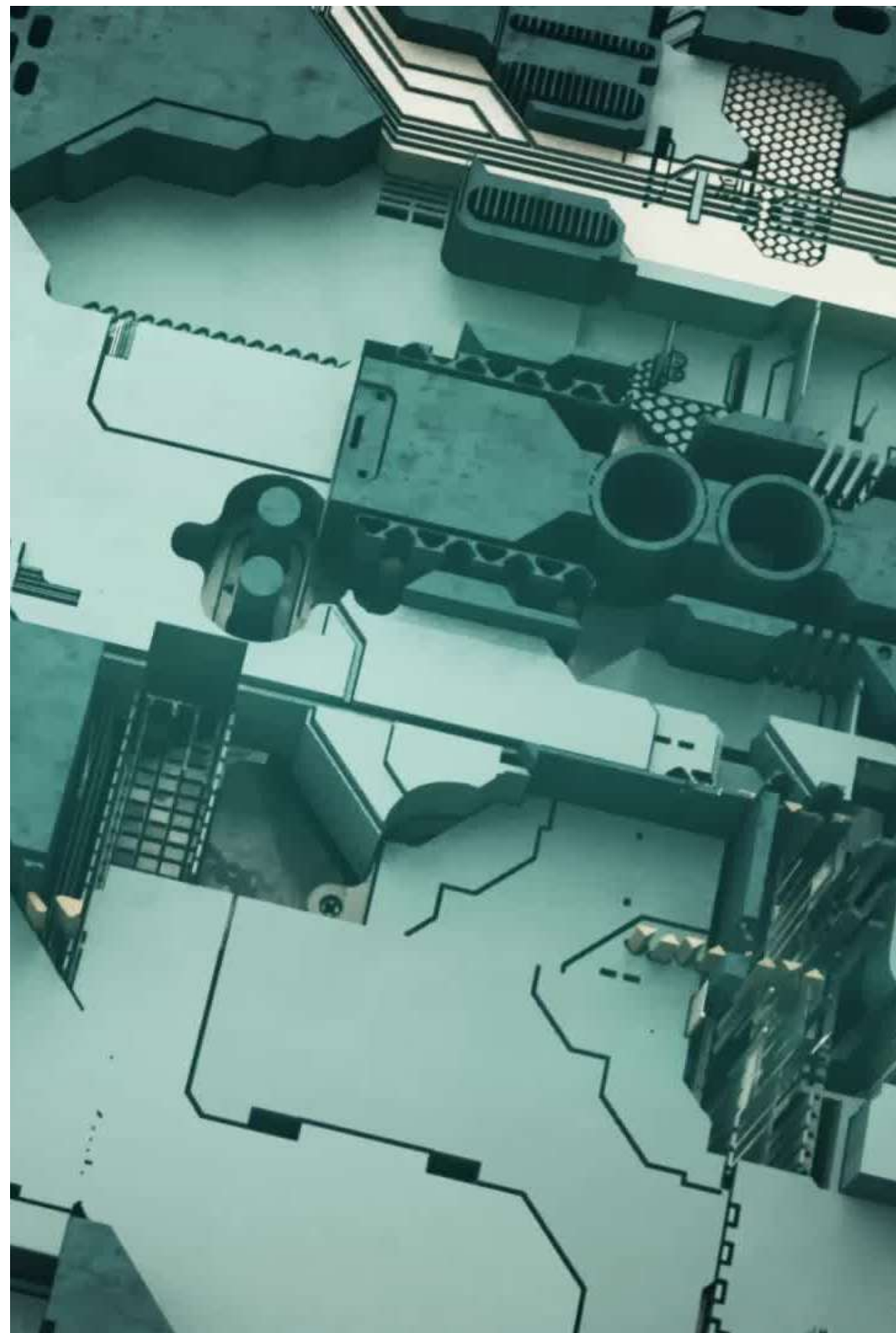
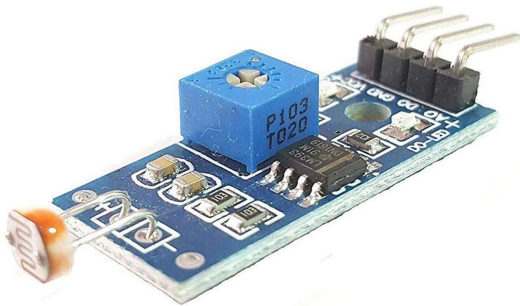
# Hardware Components

Arduino Mega: Controls motors and sensors.



# Hardware Components

LDR Laser Sensors: Item tracking and interrupt signals.

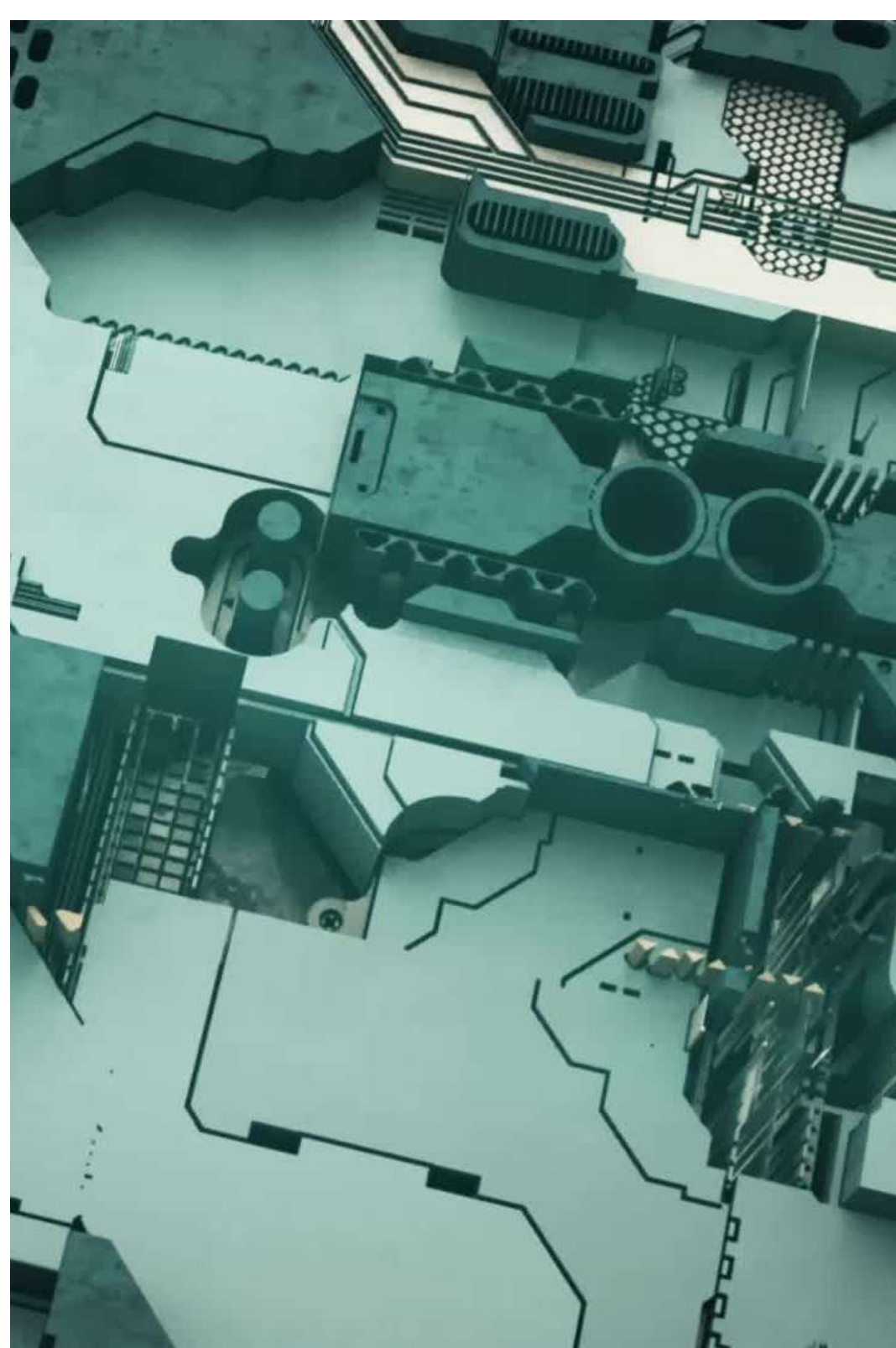


# Hardware Components

Servo Motors: Divert items to bins.

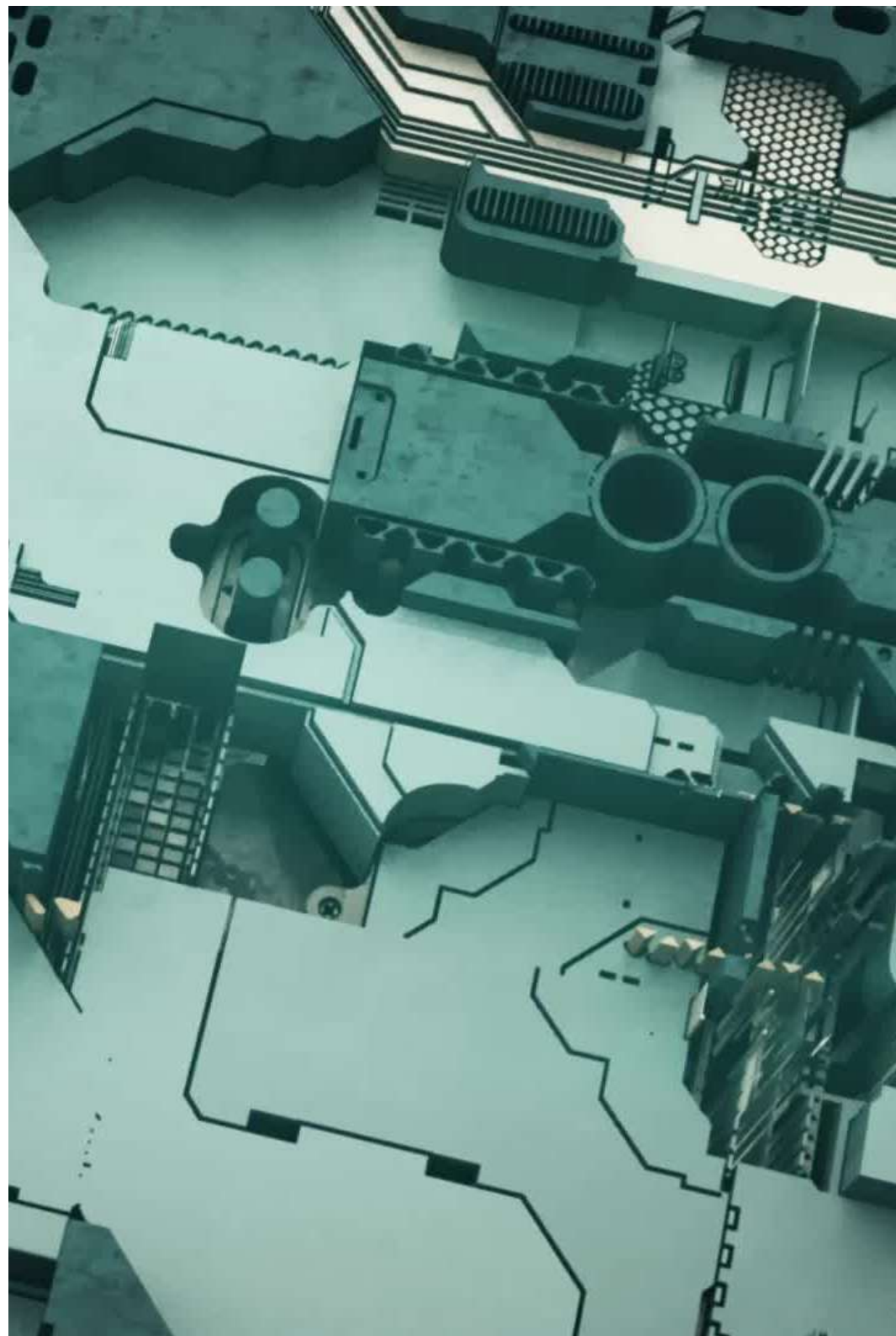
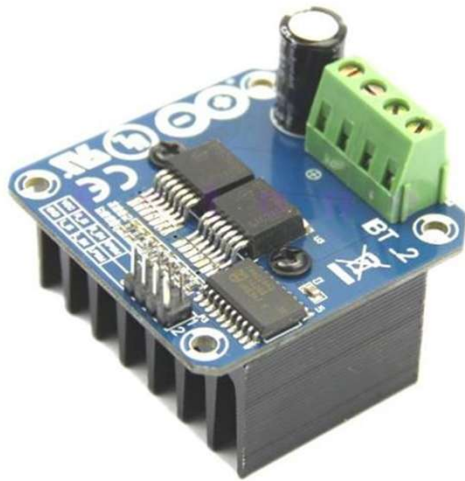
**ORONA**

**DS-558HV**



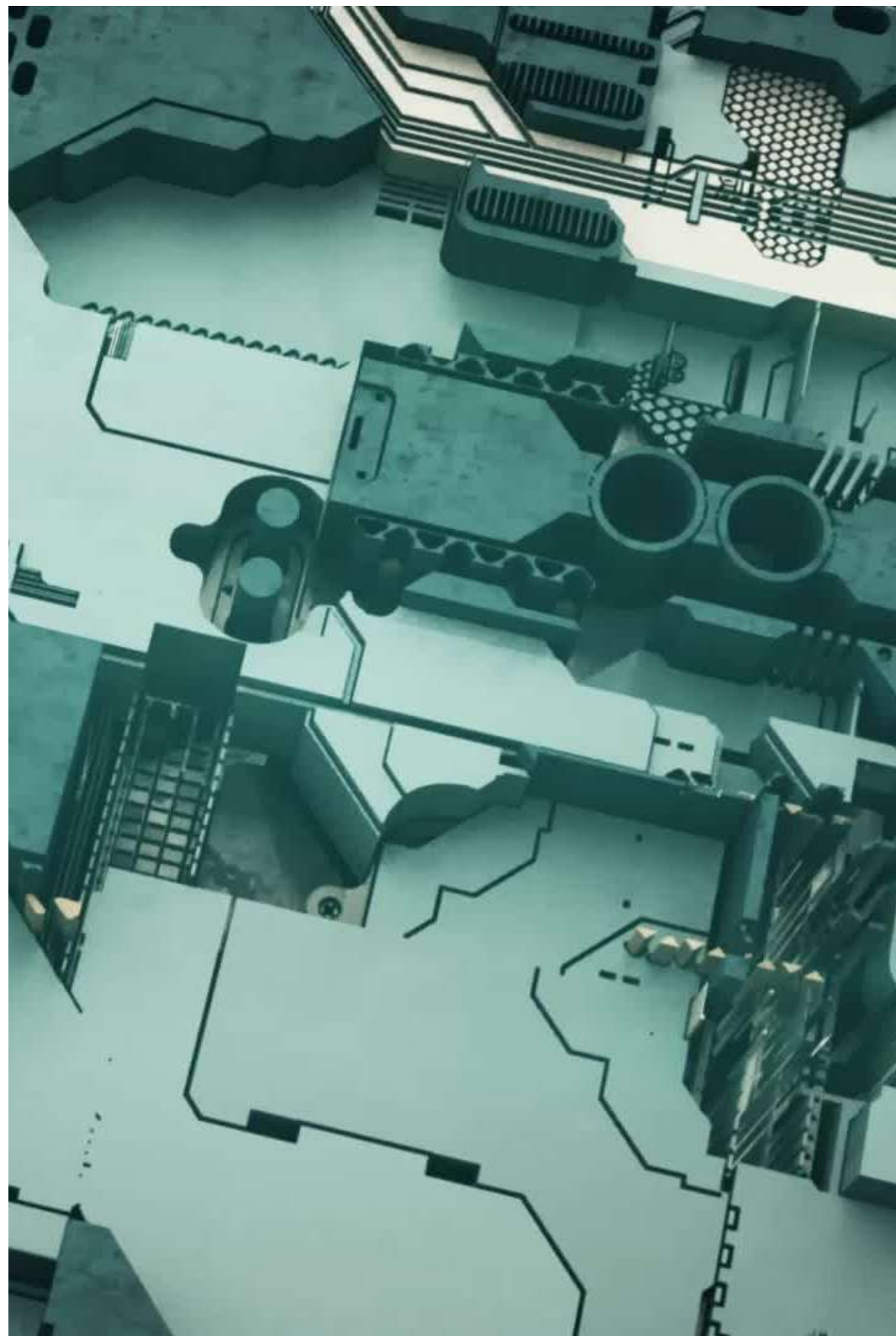
# Hardware Components

BTS7960 Motor Driver: DC motor control.



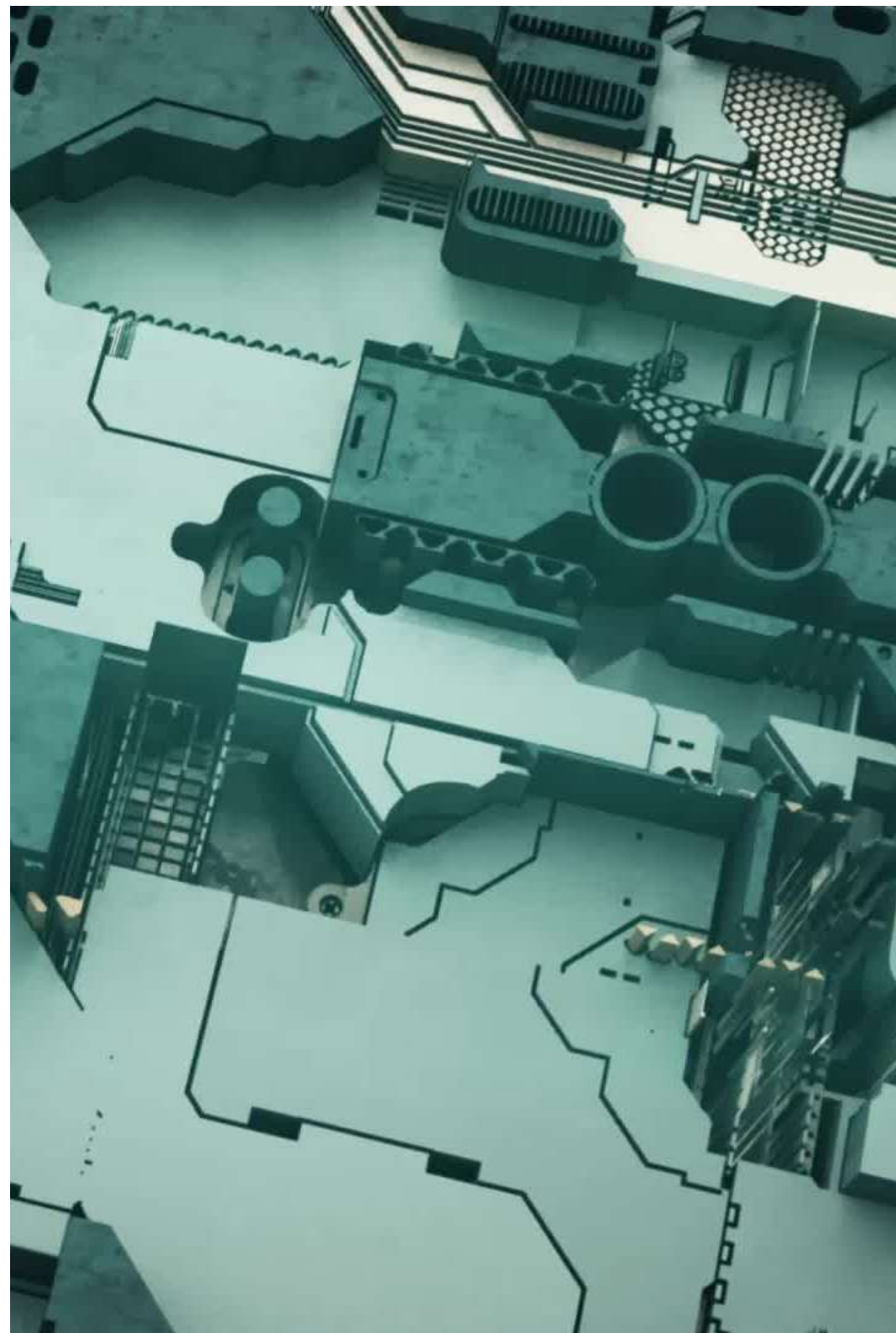
# Hardware Components

Limit Switches: Box position feedback.



# Hardware Components

Power Supply: Stable power for all components.



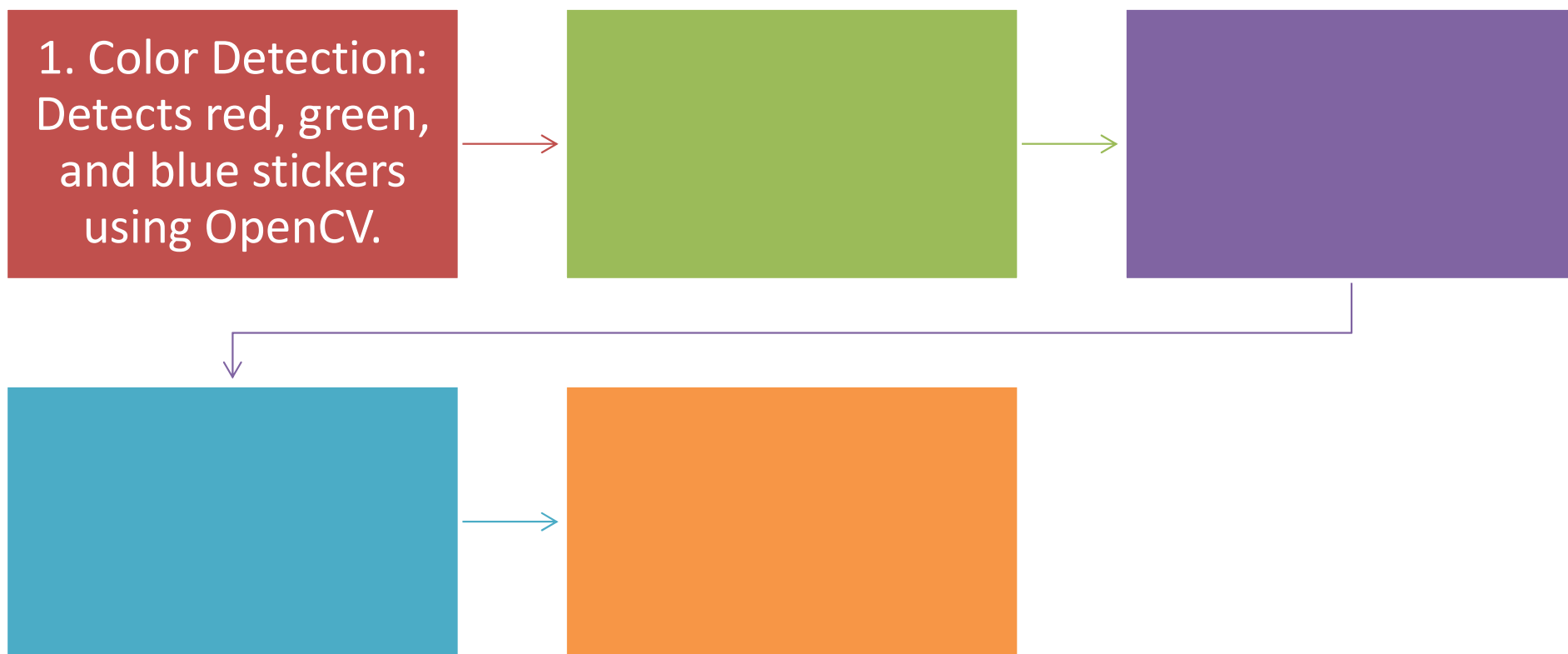


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# Software Components

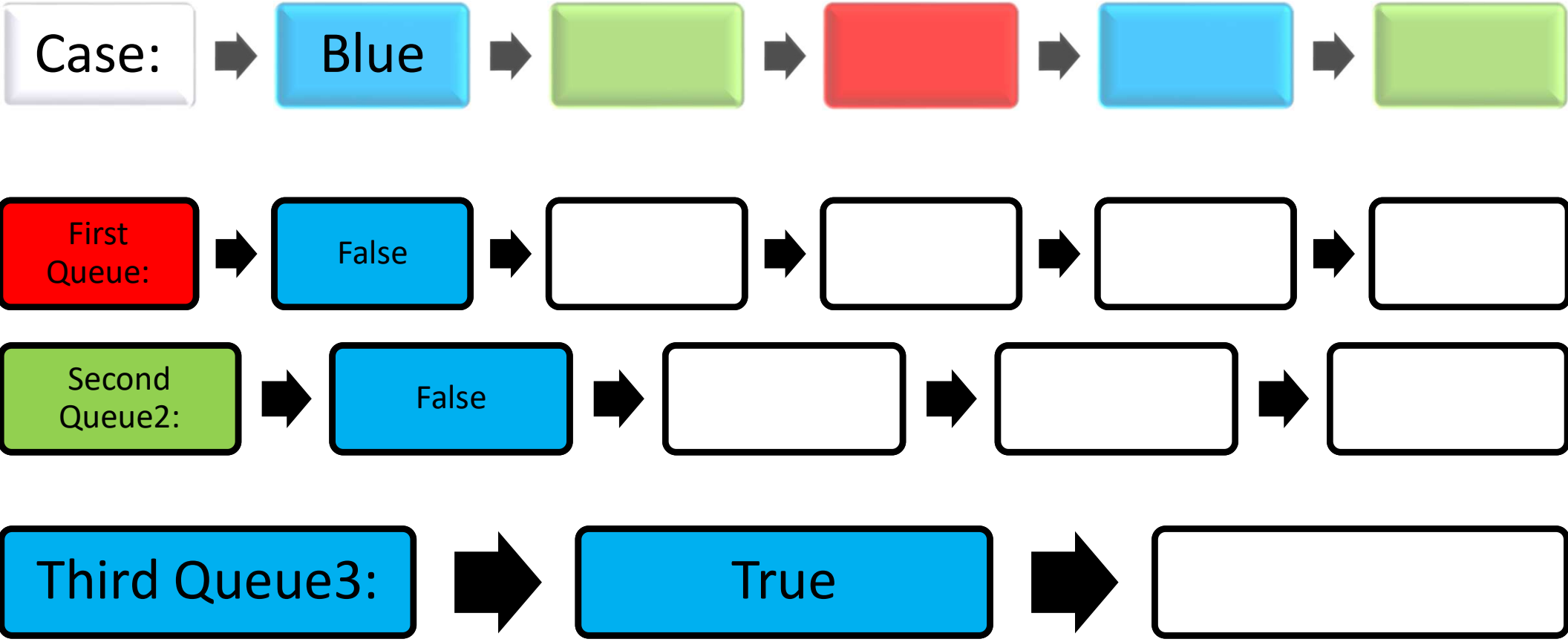
1. Python with OpenCV:
  - Image processing for color detection.
2. Firebase:
  - Real-time database for monitoring.
3. Web Application:
  - Live updates and data visualization.
4. Arduino Programming:
  - Controls hardware operations.
5. Multi-Process Programming:
  - Handles parallel tasks efficiently.

# Algorithm Overview

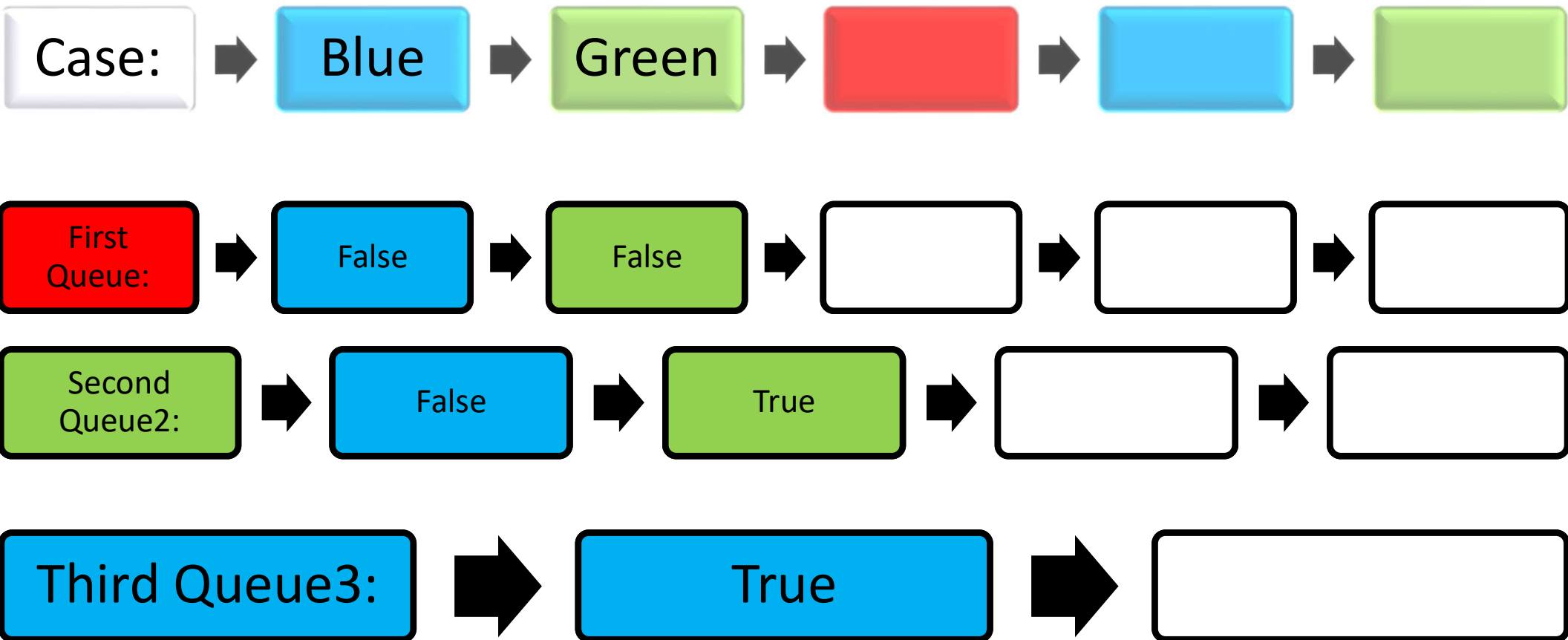




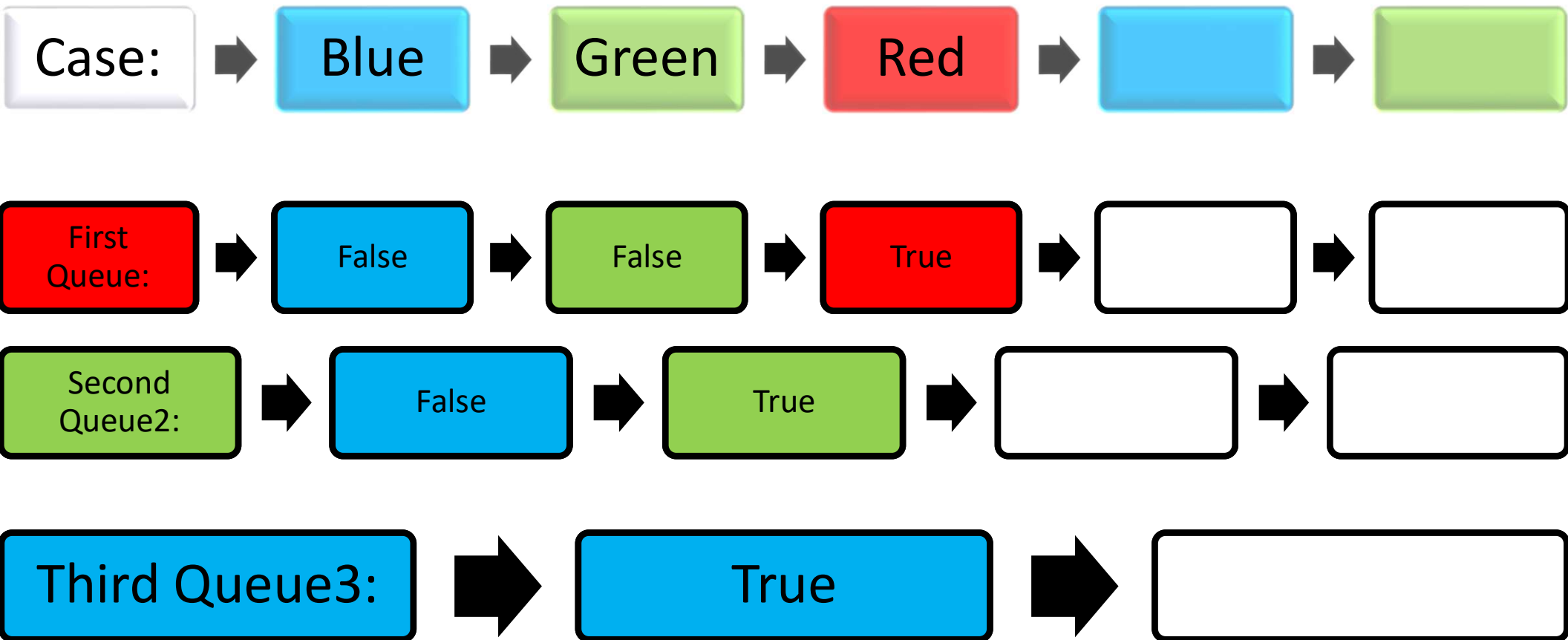
# Queuing Algorithm



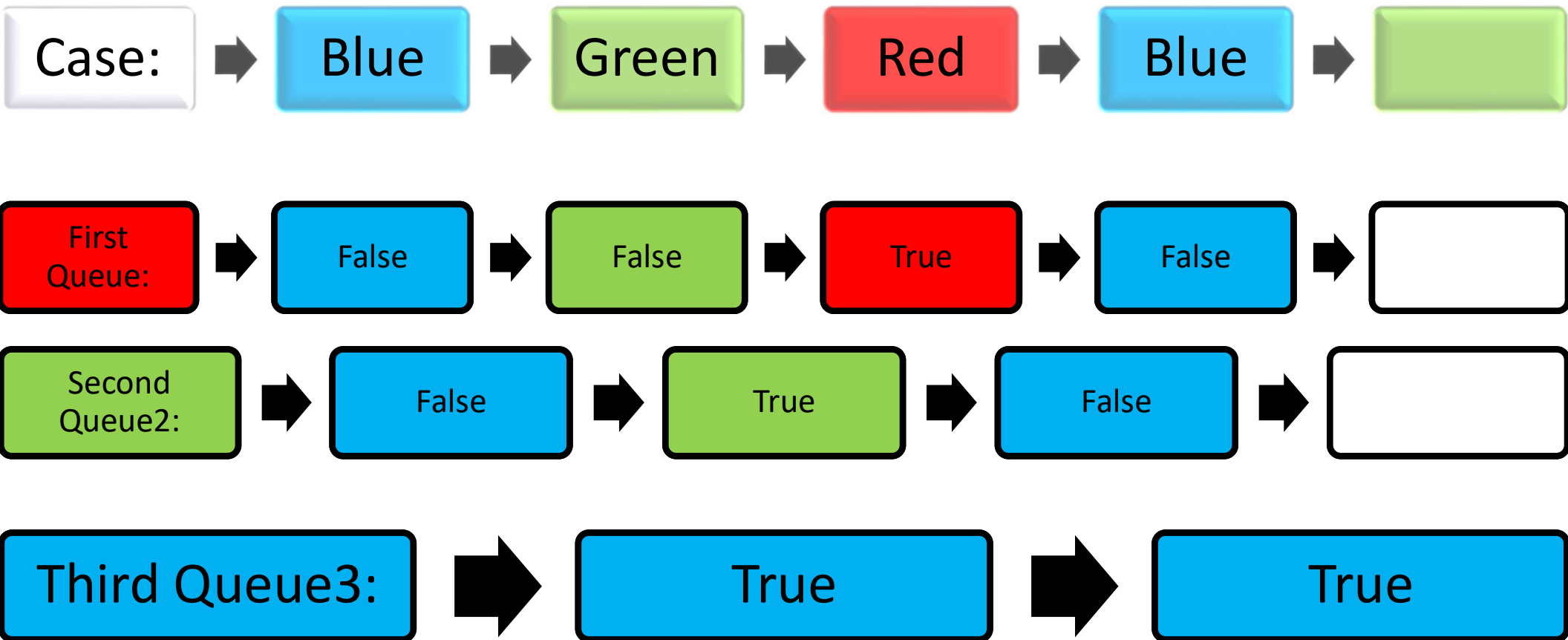
# Queuing Algorithm



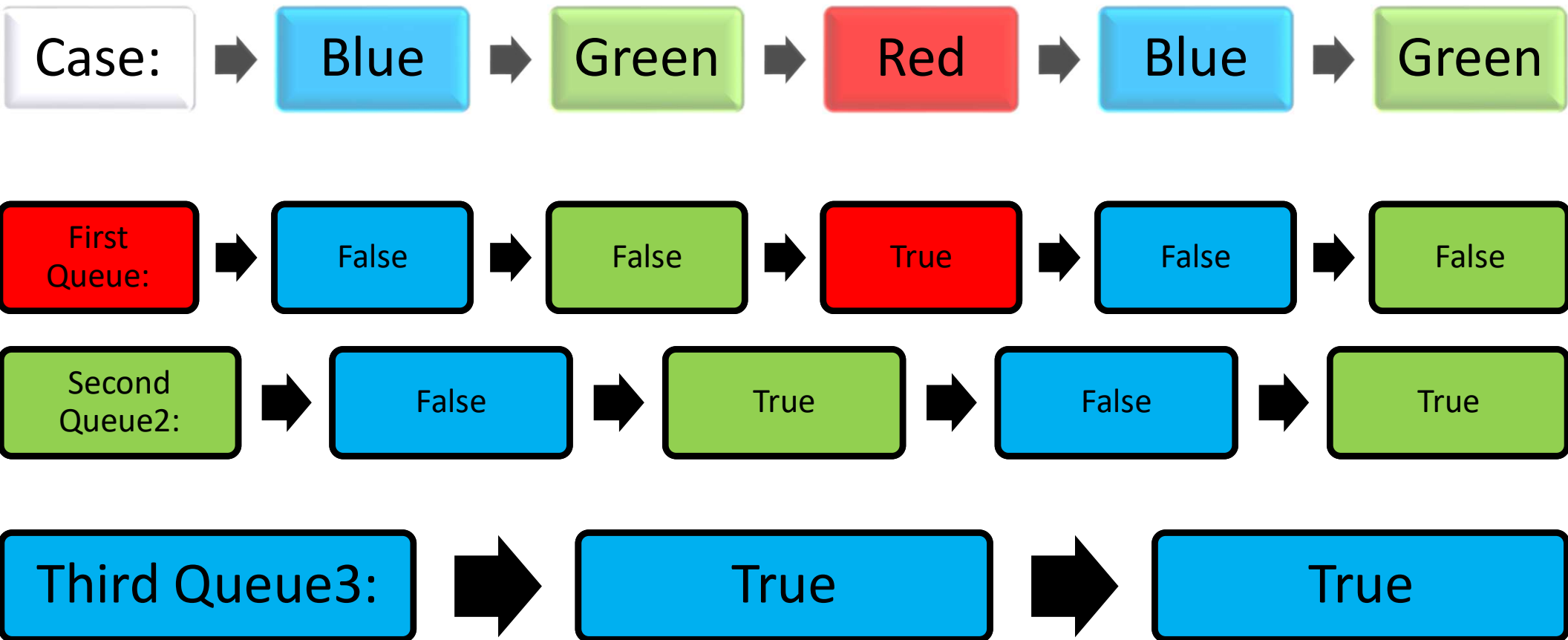
# Queuing Algorithm



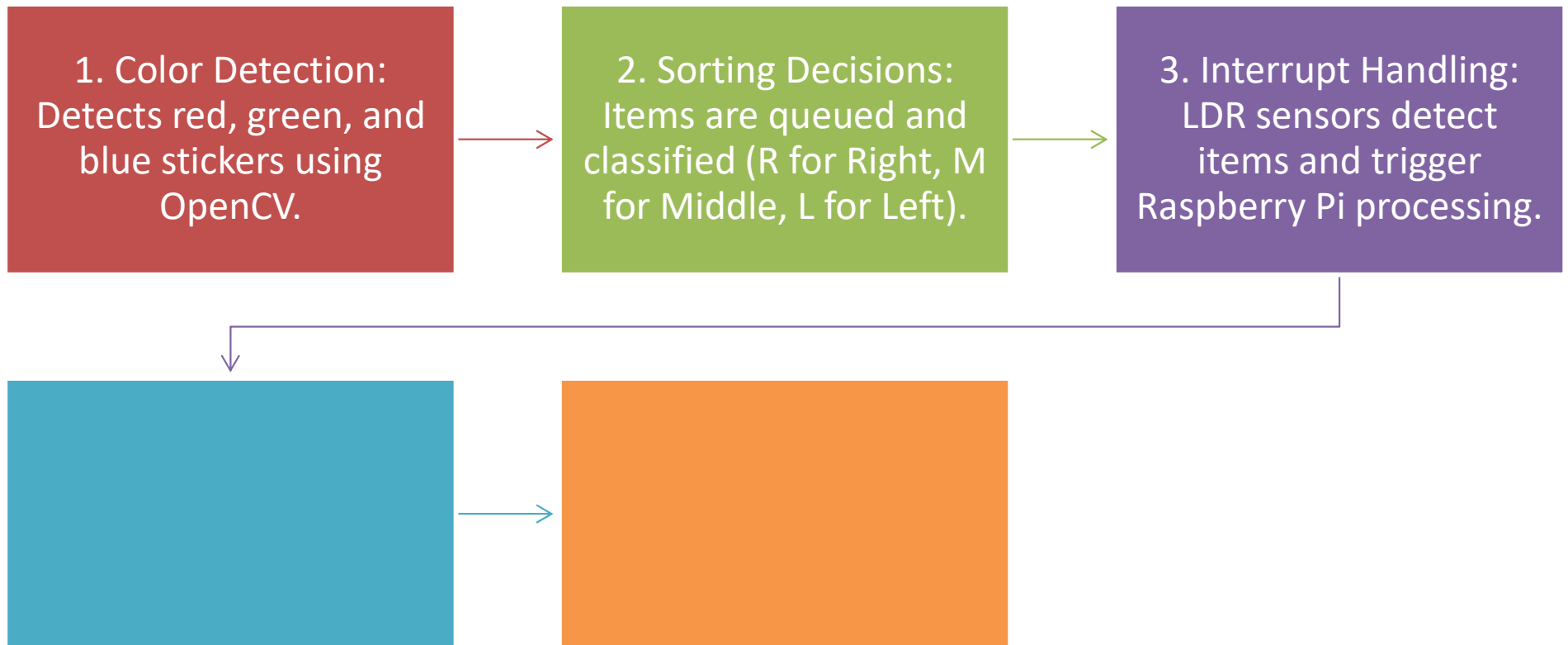
# Queuing Algorithm



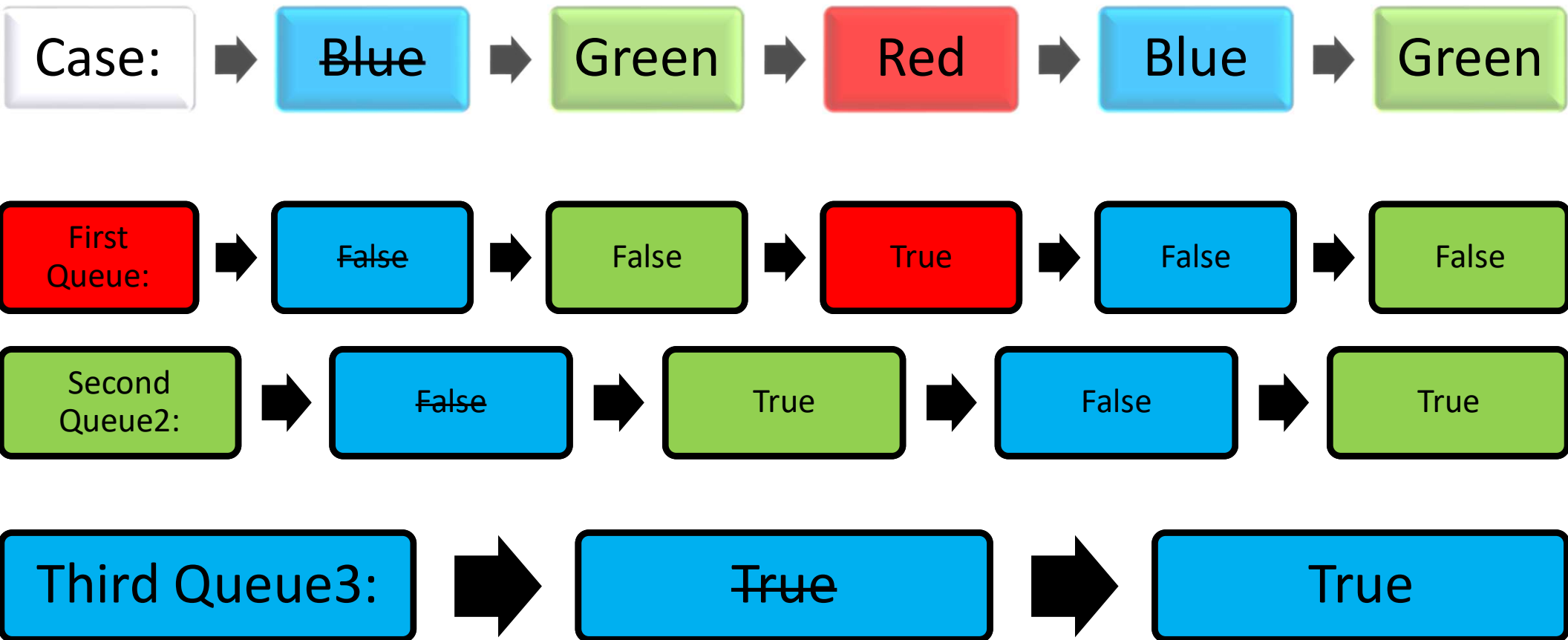
# Queuing Algorithm



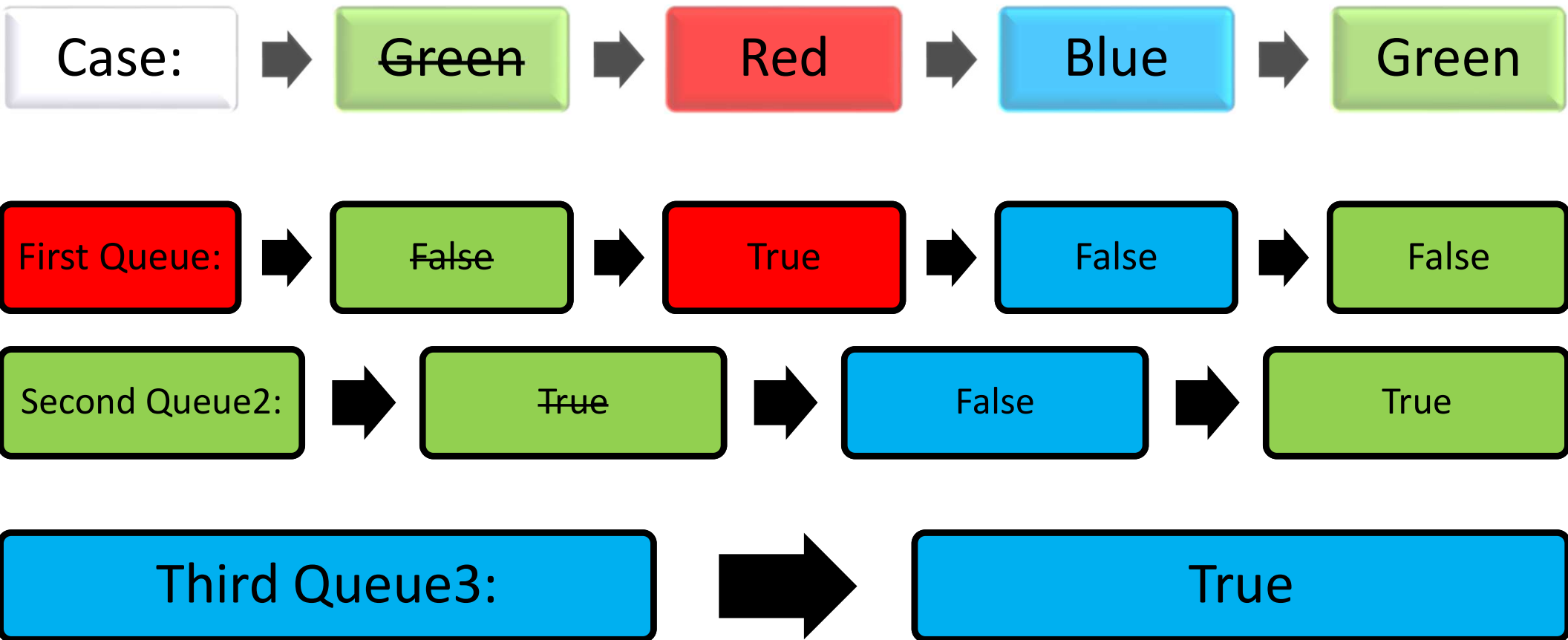
# Algorithm Overview



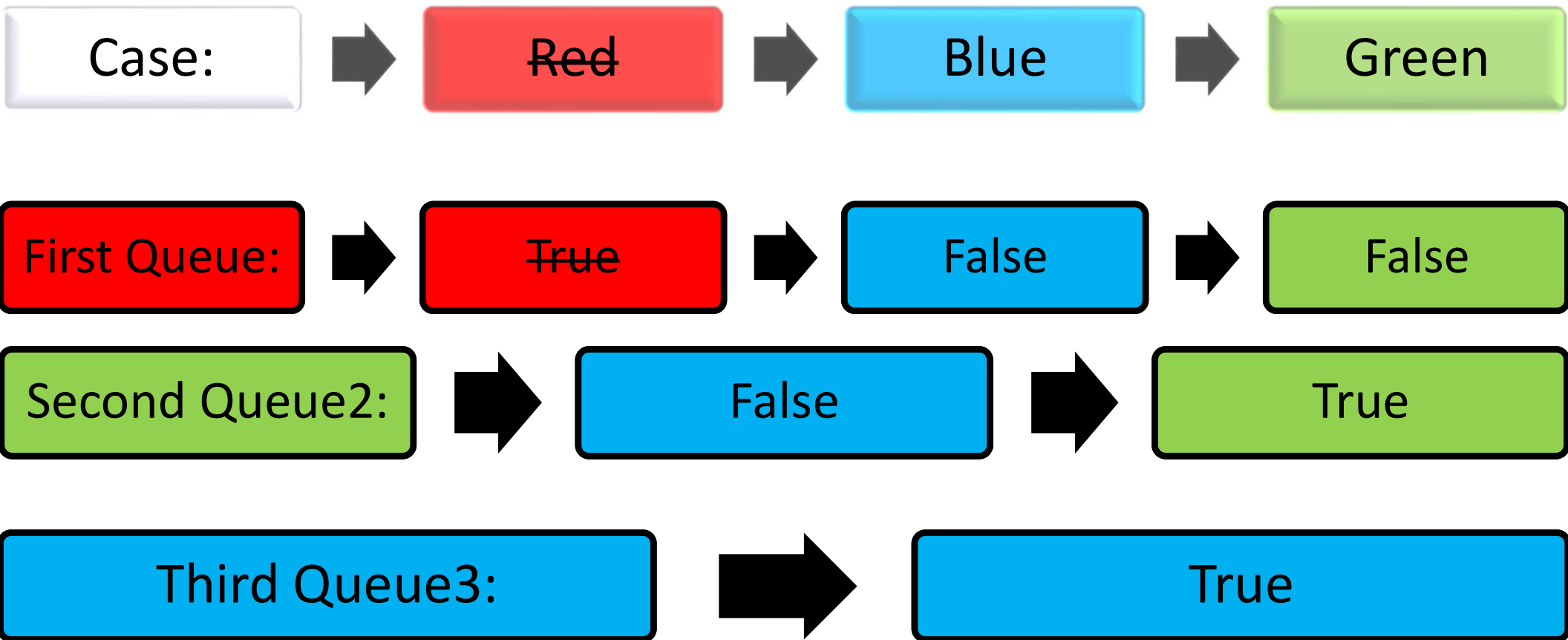
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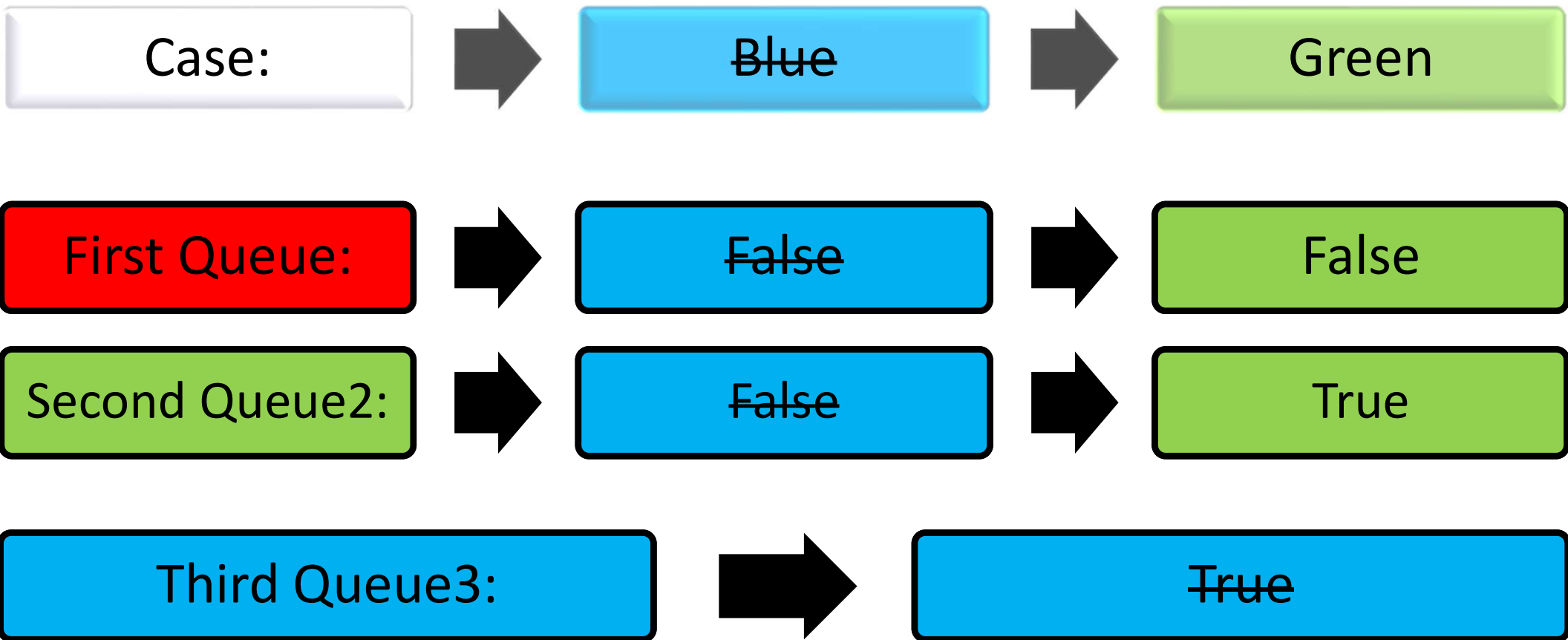
# Queuing Algorithm



# Queuing Algorithm



# Queuing Algorithm



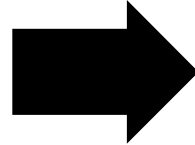
# Queuing Algorithm

Case:



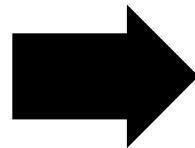
Green

First Queue:



False

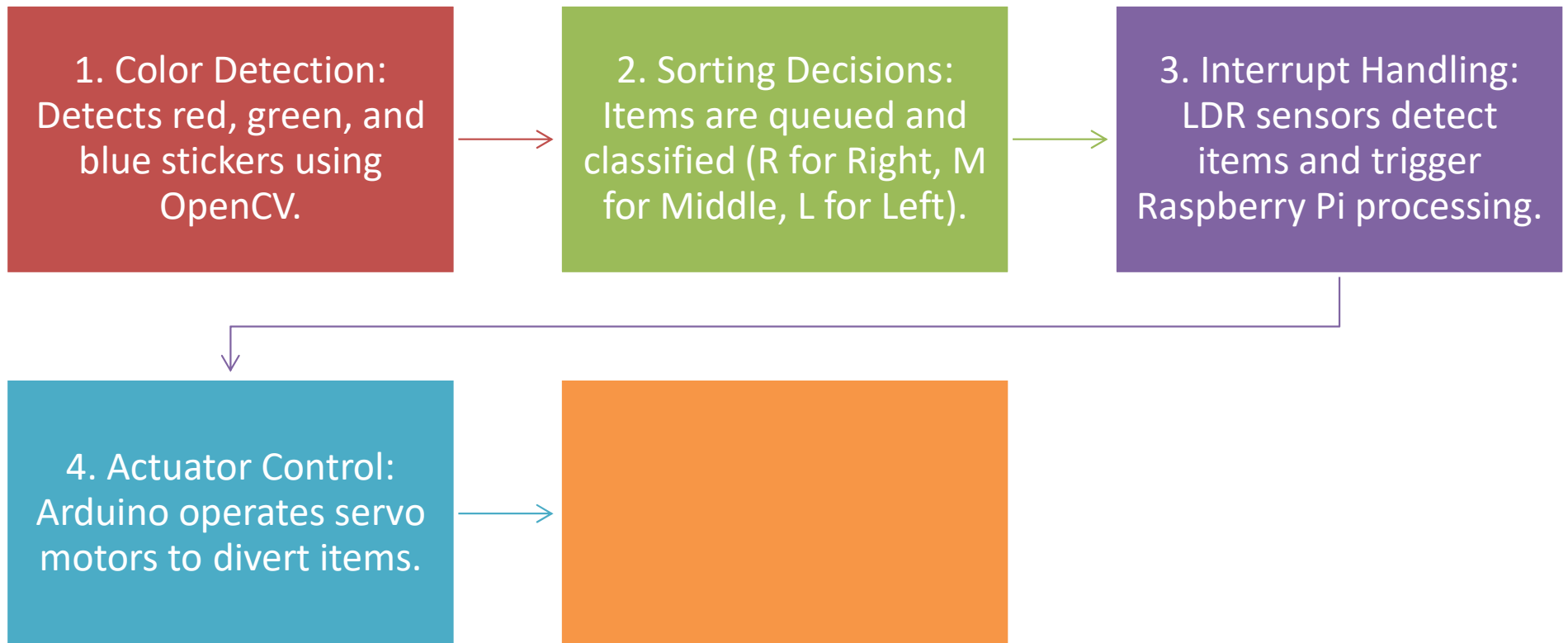
Second Queue2:



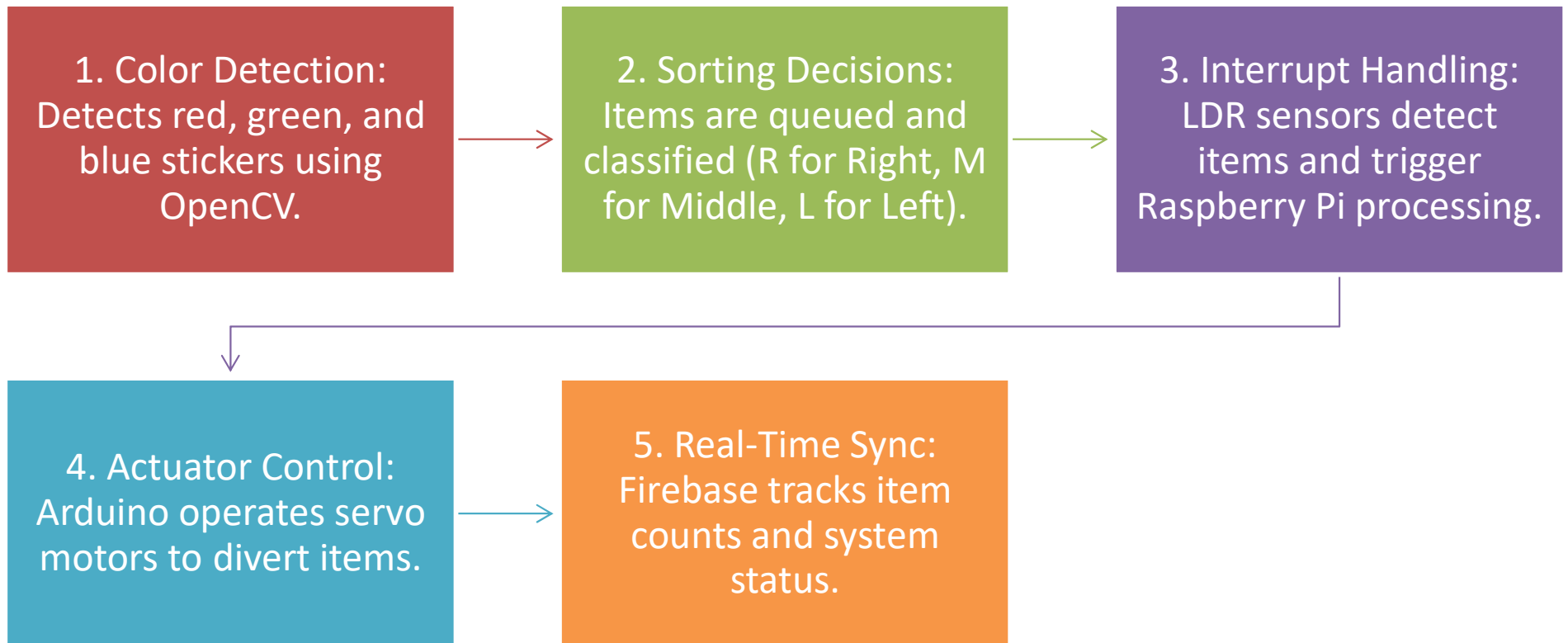
True

Third Queue3:

# Algorithm Overview



# Algorithm Overview



# Sorting System

Ahmed Awwad & Ahmad Saadeh

## Items and Boxes Count

23

item1

18

item2

17

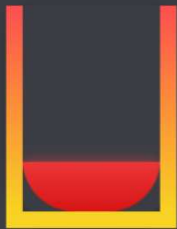
item3

11

Total Boxes

58

Total Items



Box 1: 6



Box 2: 5



Box 3: 0

Box 1: 6

Box 2: 5

Box 3: 0

# Workflow

## Step-by-Step Process:

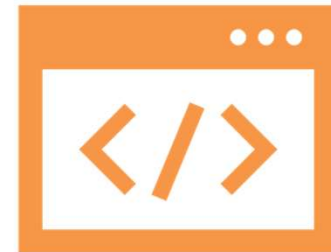
1. Place items on the conveyor belt.
2. Camera detects sticker colors.
3. Raspberry Pi processes data and issues commands.
4. Servo motors divert items into respective bins.
5. Firebase updates data in real-time, visible on the web app.



# Results



- Accurate sorting with real-time monitoring.



- Scalable and modular design.

# Challenges



1. Light sensitivity during color detection.

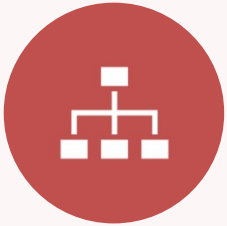


2. Synchronizing hardware and software.



3. Hardware dependency risks.

# Future Work



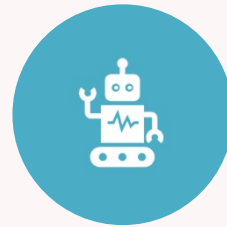
1. Enhance object classification (size, shape).



2. Add redundant sensors for reliability.



3. Improve web interface with diagnostics.



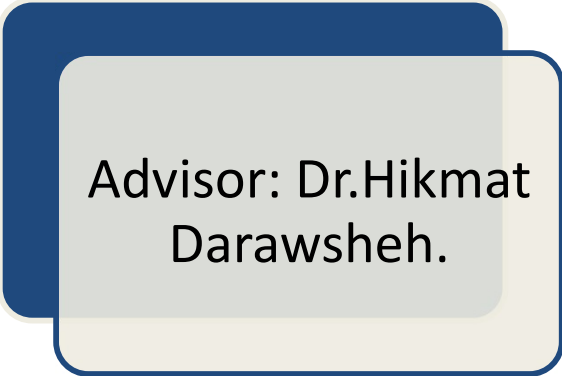
4. Use machine learning for better classification.



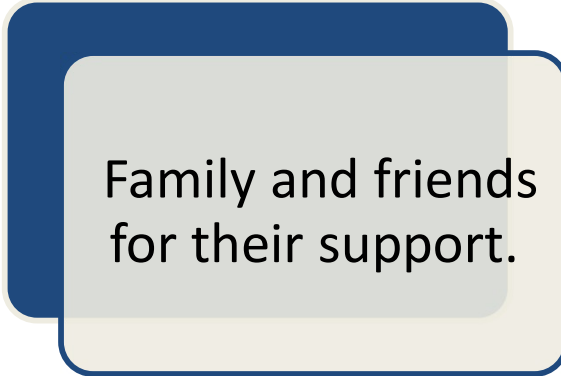
5. Scale system for more bins and sorting categories.



# Acknowledgments



Advisor: Dr.Hikmat  
Darawsheh.



Family and friends  
for their support.



An-Najah National  
University for  
resources.

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Closing

Thank You!

Questions?