

Renata AI: Push Detection System - User Manual

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Overview

The **Renata AI Push Detection System** is an intelligent quality control system that monitors wire connector insertion operations in real-time. The system automatically detects when connectors are properly pushed into terminals and provides immediate feedback through visual indicators and data logging.

What the System Does

-  Monitors Connector Insertion: Watches connectors being pushed into terminals
-  Validates Two-Step Process: Ensures both first and second pushes are completed correctly
-  Real-time Feedback: Shows OK/NG status immediately after each operation
-  Data Recording: Automatically saves all operations to database for quality records
-  Hardware Signaling: Sends results to connected Arduino for external indicators

Key Benefits

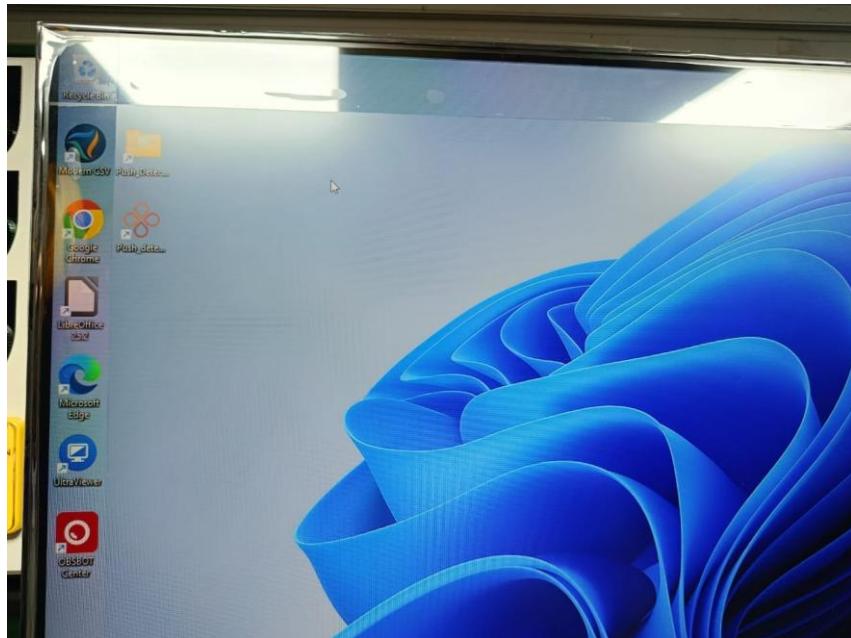
- Immediate Quality Feedback: Know instantly if insertion was successful
 - Consistent Standards: Eliminates human error in quality checking
 - Complete Records: Every operation is automatically documented
 - Easy Operation: Simply start the system and begin working
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Getting Started

Starting the Application

1. Locate the Application

- Find the file named Push_detection_RenataAI.bat on your desktop with RenataAI logo on it.



2. Double-click the Batch File

- This will automatically start the push detection system
- A black command window will appear first, followed by the camera view

3. Choose Video Source

- When prompted, choose your input method:
 - **Option 1:** Live camera (recommended for normal operation)
 - **Option 2:** Video file (for testing or reviewing recorded operations)
 - We have already defaulted to "Live Camera" operation for ease of use, so the end-user need not bother with this configuration. Our developers use the "Video File" option for debugging and testing purposes.

4. Arduino Port Configuration

- The system will ask for the Arduino COM port
- Press Enter to use the default (COM3) or type the correct port if different
- We have already setup the default COM PORT, so the end-user need not bother with this configuration as well, double-clicking the bat file (Push_detection_RenataAI.bat) will directly launch the application for him.

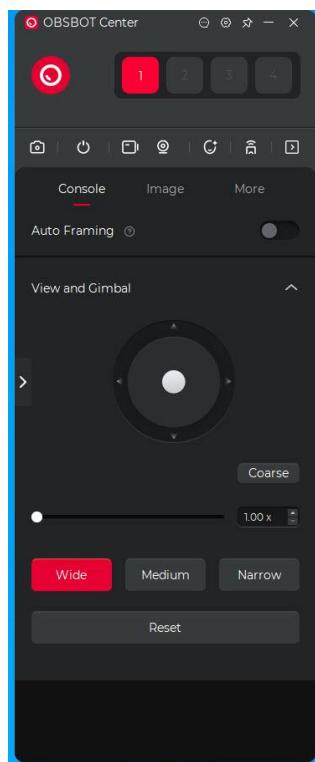
5. Wait for Initialization

- The system will load the AI model and connect to hardware
- You'll see initialization messages in the command window
- The camera view will open showing the detection interface

What You'll See After Starting

- Camera View Window: Live feed from your camera
 - Terminal Status Table: Shows current status of each terminal (top-right corner)
 - Connector Tracking: Blue circles around detected connectors
 - Terminal Boundaries: Colored outlines around each terminal position
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Camera Setup - Obsbot Center



- The end-user can often skip this section, since the developer team has already setup the required configuration for the camera required for the AI model's activity.
- Though, in case the camera configuration has been disturbed, the end-user can follow these steps:
 - Open the Obsbot Center from the Start-Menu.
 - Connect to the camera

- Check that the zoom level is set to 2.00x
 - Run the Push_detection_RenataAI.bat file again to ensure that the terminal boundaries drawn in the software overlap the actual physical terminals.
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Push Detection Process

Understanding the Detection Process

The system monitors a specific sequence for proper connector insertion:

Step 1: Waiting State (Orange)

- What it means: Terminal is ready and waiting for a connector
- What you see: Terminal outlined in orange color
- What to do: Approach the terminal with your connector

Step 2: First Push Detection (Yellow)

- What it means: System detected the first connector push
- What you see: Terminal changes to yellow color
- What to do: Perform the second push within the time limit
- Time limit: 1 second (30 frames at 30fps)

Step 3: Second Push Completion

- Success ( Green): Both pushes completed correctly within time limit
- Failure ( Red): Second push not detected in time or incorrect insertion

Step 4: Auto-Reset

- When: System automatically resets 30 seconds after all terminals are complete
- What happens: All terminals return to orange (waiting) state
- Data: Results are automatically saved to database before reset

Working with Multiple Terminals

When working with multiple terminals:

1. Work at your own pace - each terminal operates independently
2. Any order - terminals can be completed in any sequence
3. Visual feedback - each terminal shows its own status color
4. Overall status - top-right table shows system-wide status

Best Practices for Detection

Connector Positioning

- Stay close: Keep connector within the detection zone around each terminal
- Clear movement: Make deliberate push movements
- Avoid covering: Don't block the camera's view of the connector or terminal

Timing

- First push: Push firmly to register the first detection
- Second push: Complete within 1 second for success
- If yellow appears: You have successfully completed the first push
- If red appears: Start over - system will reset that terminal

Lighting and Environment

- Consistent lighting: Ensure good lighting on the work area
 - Stable camera: Keep camera position fixed during operation
 - Clear background: Avoid cluttered backgrounds that might interfere with detection
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User Interface Guide

Main Display Window

Status Table (Top-Right Corner)

The status table shows you the current state of the quality control system:

- "**TERMINAL STATUS**" - Header showing this is the status display
- **Terminal Rows:**
 - "T1", "T2", "T3" etc. - Each terminal number
 - Status column shows: **WAIT**, **OK**, or **NG**
- **Overall Row:** Shows the final system status
 - **WAIT**: Still working on some terminals
 - **OK**: All terminals completed successfully
 - **NG**: One or more terminals failed

Color-Coded Terminal Boundaries

Each terminal is outlined with colored boundaries that change based on status:

-  Orange: Waiting for connector (ready to start)
-  Yellow: First push detected successfully
-  Green: Both pushes completed successfully (OK)
-  Red: Failed insertion or timeout (NG)

Connector Tracking Display

- Blue circles: Show detected connectors in real-time
- White lines: Connect connectors to their assigned terminals (when in debug mode)
- ID numbers: Each connector gets a unique tracking number

Keyboard Controls for Operators

Essential Controls

- **R:** Reset all terminals manually (starts new cycle)
- **P:** Pause/resume the detection system
- **Q:** Quit the application
- **D:** Toggle debug mode (shows extra information)

Data and Information

- **S:** Show statistics in command window
- **C:** Export current data from Postgres database to a CSV file - the CSV files exported will be visible in the folder Push_detection_Exports in the desktop with their respective timestamps.
- **B:** Show database information
- **A:** Test Arduino connection

Information Display

When you press these keys, information appears in the black command window:

- **S:** Current performance statistics
- **B:** How many records are stored in database
- **C:** Creates a CSV file with all recorded data - the CSV files exported will be visible in the folder Push_detection_Exports in the desktop with their respective timestamps.

Reading the Display

During Normal Operation

1. Watch the terminal colors - this tells you the current status
2. Monitor the status table - shows overall progress
3. Follow connector tracking - blue circles show detected connectors
4. Check the overall status - tells you when cycle is complete

Auto-Reset Feature

- Countdown timer: When all terminals are complete, you'll see "AUTO-RESET IN: X.X s"
- Automatic cycling: System resets after 30 seconds automatically
- Data saving: All results are saved before reset

Frame Rate and Performance

- FPS counter: Shows system performance (top-right corner)
 - Frame counter: Shows current frame number being processed
 - Status messages: Important information appears in the command window
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Viewing Data in PostgreSQL

Accessing Your Quality Records

The system automatically stores all inspection results in a PostgreSQL database. Here's how you can view your quality control data:

Opening PostgreSQL Database Viewer

1. **Find pgAdmin on your computer**
 - Look for "pgAdmin 4" in your Start menu
 - Double-click to open the database viewer
2. **Connect to the Database**
 - You'll see a server tree on the left side
 - Expand "Servers" → "PostgreSQL" → "Databases"
 - Look for database named "pushdetection"
 - Double-click to connect
3. **Navigate to Your Data**

- Expand "pushdetection" → "Schemas" → "public" → "Tables"
- Find the table named "evaluations"
- Right-click on "evaluations" and select "View/Edit Data" → "All Rows"

Understanding Your Data

The evaluations table contains these columns:

- id: Unique record number for each inspection cycle
- timestamp: Exact date and time of the inspection
- overall_status: Final result (OK, NG, or WAIT)
- terminal_statuses: Individual status of each terminal (T1:OK, T2:NG, etc.)

Common Data Queries

View Recent Inspections:

```
SELECT timestamp, overall_status, terminal_statuses
FROM evaluations
ORDER BY timestamp DESC
LIMIT 20;
```

Count Successful vs Failed Inspections:

```
SELECT overall_status, COUNT(*) as count
FROM evaluations
GROUP BY overall_status;
```

View Today's Results:

```
SELECT * FROM evaluations
WHERE DATE(timestamp) = CURRENT_DATE;
```

Exporting Data from PostgreSQL

1. Right-click on the evaluations table
2. Select "Import/Export Data"
3. Choose "Export"
4. Select file format (CSV recommended)
5. Choose save location

6. Click "OK" to export

Alternative (RECOMMENDED): Using the Application's Export Feature

The easier way to get your data is using the application's built-in export:

1. While the application is running, press the **C** key
 2. Data is automatically exported to CSV format
 3. File is saved in the "exports" folder
 4. Open with Excel or any spreadsheet program
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Arduino Data Transmission

How Results are Sent to Arduino

The system automatically communicates inspection results to your connected Arduino device for external signaling (lights, alarms, etc.).

Automatic Signal Transmission

When signals are sent:

- After each complete inspection cycle (when all terminals are evaluated)
- Before the system resets for the next cycle
- Only when all terminals have final status (OK or NG)

Signal Types:

- "**OK**": Sent when ALL terminals are successful (green)
- "**NG**": Sent when ANY terminal failed (red) or timeout occurred

Arduino Connection Status

In the command window, you'll see:

- " Arduino controller integrated successfully" - Connection working
- " Arduino controller not available" - Connection failed
- " Signal 'OK' sent to Arduino successfully" - Signal transmitted
- " Failed to send signal" - Communication error

Testing Arduino Connection

1. Press the **A** key while application is running

2. Watch the command window for test results
3. Arduino will receive test signals to verify connection
4. Check your Arduino indicators (lights, displays, etc.)

Arduino Communication Details

Connection Settings:

- **Port:** Usually COM3 (displayed during startup)
- **Baud Rate:** 9600
- **Data Format:** Simple text commands ("OK" or "NG")

What your Arduino receives:

- String "OK" when inspection cycle passes
- String "NG" when inspection cycle fails
- Signals are sent immediately after evaluation

Troubleshooting Arduino Connection

If you see "Arduino not available":

1. Check USB cable connection
2. Verify COM port in Windows Device Manager
3. Ensure Arduino sketch is properly loaded
4. Restart the application if needed

Testing the connection:

1. Press A key during operation
2. Watch for response in command window
3. Check Arduino indicators respond to test signals

Troubleshooting

Application Won't Start

Problem: Double-clicking the bat file does nothing

Solutions:

1. Right-click the bat file and select "Run as administrator"
2. Check if conda is installed - you should see conda mentioned in the command window
3. Look for error messages in the black command window that appears briefly

4. Try restarting your computer and running again

Problem: "Environment 'venv' not found" error

Solutions:

1. Contact your system administrator - the Python environment needs to be set up
2. Don't close the error window - take a screenshot to show technical support

Problem: Application starts but camera doesn't work

Solutions:

1. Check camera connection - make sure USB camera is plugged in
2. Try different camera selection - when prompted, try a different camera number (0, 1, or 2)
3. Close other applications that might be using the camera (Skype, Teams, etc.)
4. Check camera privacy settings in Windows settings

Detection Problems

Problem: System doesn't detect connectors

Solutions:

1. Check lighting - ensure good lighting on the work area
2. Position camera properly - connectors should be clearly visible
3. Clean camera lens - wipe any dust or smudges
4. Avoid covering terminals - keep hands and tools away from terminal areas
5. Check terminal boundaries - colored outlines should be visible around terminals

Problem: False detections or wrong results

Solutions:

1. Work slower and more deliberately - make clear, distinct push movements
2. Keep connectors in view - don't move too fast or go off-camera
3. One connector at a time - work on one terminal before moving to next
4. Press 'R' to reset if system gets confused

Problem: System shows red (NG) when insertion was correct

Solutions:

1. Check timing - second push must be within 1 second of first push
2. Make stronger pushes - ensure pushes are firm and deliberate
3. Stay close to terminal - connector must be very close to terminal boundary
4. Try again - press 'R' to reset and repeat the operation

Database and Data Problems

Problem: "Database not available" messages

Solutions:

1. Check if PostgreSQL is running - look for PostgreSQL in Task Manager
2. Contact system administrator - database service may need restarting
3. Data is still being recorded - system uses backup storage automatically

Problem: Cannot export data (CSV export fails)

Solutions:

1. Check disk space - ensure enough space on hard drive
2. Close Excel or other programs that might have CSV files open
3. Try different export location - press 'C' key to export to default location
4. Run as administrator - right-click the bat file and "Run as administrator"

Arduino Connection Problems

Problem: "Arduino not available" warning

Solutions:

1. Check Arduino USB cable - ensure it's properly connected
2. Look in Device Manager - Arduino should appear under Ports (COM & LPT)
3. Note the COM port number - tell system administrator if it's not COM3
4. Try pressing 'A' key - this tests the Arduino connection

Problem: Arduino doesn't respond to signals

Solutions:

1. Check Arduino indicators - LEDs, displays, or connected devices
2. Press 'A' key for test - this sends test signals to Arduino
3. Contact technical support - Arduino program may need checking

Performance Issues

Problem: System runs very slowly or freezes

Solutions:

1. Close other programs - especially video applications or games
2. Check available RAM - system needs sufficient memory
3. Restart the application - close and reopen using the bat file
4. Restart computer if problems persist

Problem: Poor video quality or low frame rate

Solutions:

1. Improve lighting - add more light to the work area
2. Check camera settings - use camera's own software to adjust settings
3. Close unnecessary programs - free up computer resources
4. Check USB connection - try different USB port

When to Contact Support

Always contact technical support if:

- Error messages mention "model not found" or "initialization failed"
- Application won't start after trying basic troubleshooting
- Database problems persist after checking PostgreSQL
- Arduino connection cannot be established
- System accuracy seems significantly reduced

Information to provide when contacting support:

- Exact error message text (take screenshot of command window)
- What you were doing when the problem occurred
- Whether problem is consistent or intermittent
- Computer and camera information

Quick Reset Procedures

Soft Reset (Most Problems)

1. Press 'R' key to reset terminals
2. Continue working - system clears and starts fresh cycle

Application Restart (Persistent Issues)

1. Press 'Q' key to quit application
2. Double-click bat file to restart
3. Wait for full initialization before working

System Restart (Serious Problems)

1. Close all applications
2. Restart Windows
3. Start application using bat file
4. Contact support if problems continue