

# Ricoh Project : Smart Paper Stack Palletizing URCap Development

## Background & Context

Robot palletizing has become a cornerstone of modern manufacturing automation, enabling consistent, efficient, and safe handling of products in warehouse and production environments. Traditional palletizing systems rely on fixed programming with predetermined patterns, limiting flexibility when handling varying product dimensions or pallet configurations. Current robot palletizing solutions often require extensive programming knowledge and lack intuitive user interfaces for operators to modify configurations. By leveraging Universal Robots' URCap framework and Java-based application development, we aim to create a comprehensive palletizing solution that provides automatic optimization capabilities for paper stack handling operations, making advanced palletizing accessible to operators without programming expertise.

## Goals and Approach

**Goal:** Develop an URCap application that enables various paper stack palletizing with dual operational modes (automatic and manual), intelligent palletizing layout optimization, and real-time status monitoring using Java-based software development.

### Approach:

- Build comprehensive URCap framework using Java and Swing UI components
- Implement dual-mode operation system for manual and automatic configuration
- Develop intelligent layout algorithms for optimal pallet pattern generation
- Create real-time status monitoring and progress tracking system

### Prerequisites:

Students participating in this project should have foundational knowledge in the following areas:

- Java Programming: Object-oriented programming, data structures, and exception handling
- GUI Development: Basic understanding of event-driven programming and user interface design
- Software Engineering: Familiarity with design patterns, version control (Git), and project build systems
  - Algorithm Design: Understanding of optimization algorithms and spatial reasoning concepts

### Tools & Resources:

- URCap SDK for Universal Robots application development
- Java 8+ with Swing framework for user interface development
- Maven for project dependency management and build automation
- IntelliJ IDEA or Eclipse IDE with URCap development plugins

## Expected Outcomes

- Complete URCap application with user interface

- Intelligent layout optimization algorithms for palletizing
- Dual-mode operation supporting manual and automatic configuration
- Real-time palletizing status dashboard with progress tracking

#### References

- <https://www.universal-robots.com/articles/ur/urplus-resources/urcap-basics/>
- [URcap developer guide](#)