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Inventory Control with Pattern Recognition and RFID

ZIN TECHNOLOGIES

Company Sponsor: ZIN Technologies
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Problem Statement

Aboard the International Space Station (ISS) the astronauts have what NASA calls medical convenience kits. NASA's pharmacy currently places printed labels with a Radio Identification (RFID) tag under each label on each item in the medical convenience kit. When packing a shipment for the International Space Station (ISS) each items label and RFID information is manually entered into an Excel spreadsheet.

This current data entry method is highly inefficient. It takes a significant amount of time and allows for human error when entering the data manually. To prevent human error and optimize the time needed for inventory entry, we have designed the Optimized Inventory Control System (OICS) using OCR and RFID-NFC.
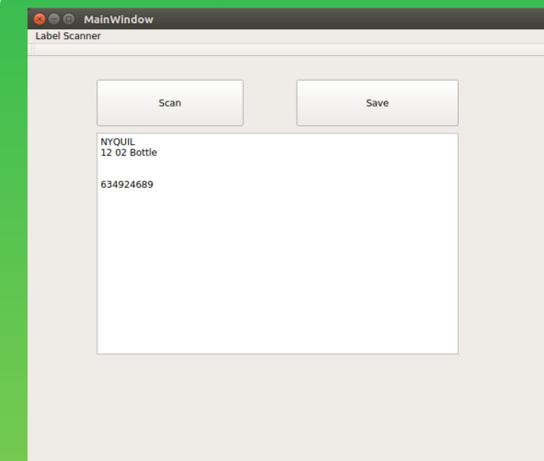
Optimized Inventory Control System

Complete system ready for scanning

- The OICS uses an overhead adjustable camera along with a beneath the surface Arduino NFC scanner.
- This allows for a controlled setup that will ensure consistent results.
- Fully modular and portable system

Graphical User Interface

OICS GUI with example Nyquil label data

For each item being scanned, the user places the item on the OICS surface and presses "Scan." After results appear, pressing "Save" sends the label data to the CSV file.

Design Objectives

- Design and build a system to improve the efficiency of inventory control data entry through the use of Optical Character Recognition (OCR) and RFID tags.
- Data acquisition with minimal user input.
- Document inventory as a spreadsheet.

Results

- For test of 11 sample labels (including NFC tag):
  - 8 scanned successfully (read label and RFID correct on 1st scan)
  - Remaining 3 were acquired successfully on the second try
  - No errors enter spreadsheet, user does not press "save" unless correct text is read into the GUI

Efficiency/Effectiveness

- A decrease in data entry time
- A complete removal of human error possibility
- Small, modular, portable physical construction
- All parts are readily available for replacement if needed

Tesseract OCR

Tesseract OCR was used for the OICS. It is an open source optical character recognition engine. First developed by Hewlett Packard (HP) between 1985 and 1994, later made open source in 2005 by HP and the University of Nevada, and now sponsored by Google since 2006.
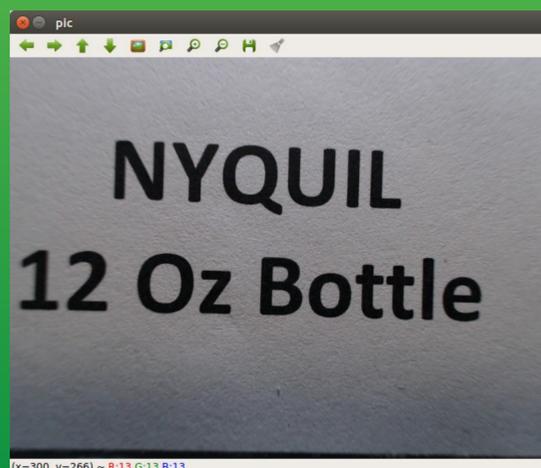
Example label photo sent to OCR.

Delimiting Output
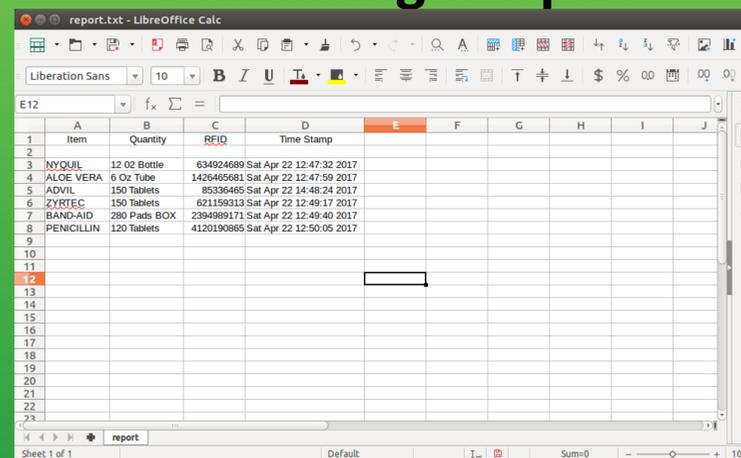
Inventory Spreadsheet - Final system output for documenting inventory before departure.

A python program was written to write the RFID (from Arduino) and label information (from Tesseract) to a comma-separated value (CSV) file. The file can then be opened in any spreadsheet program for viewing.

RFID—NFC

- The Adafruit PN532 NFC Controller uses the most commonly used NFC controller chip on the market.
- Antenna is capable of scanning 13.56Mhz tags up to 10cm away.
- Baud rate of 115200 for SPI communications between the NFC controller and the Arduino.
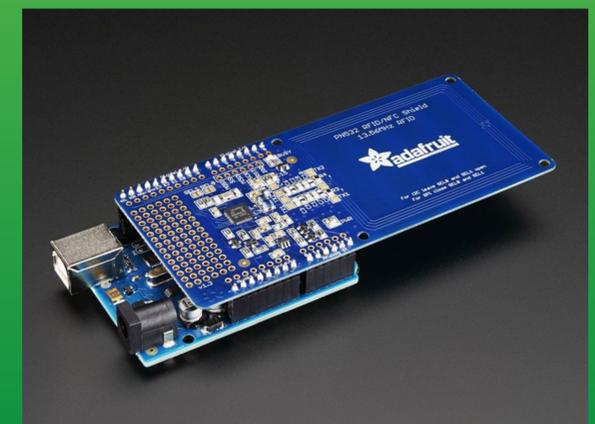
Arduino Uno with Adafruit PN532 NFC controller attached