

Smart Inventory
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INTERFACE CONTROL DOCUMENT

INTERFACE CONTROL DOCUMENT FOR Smart Inventory

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1. Overview

This internal control document (ICD) is intended to describe the interactions between the subsystems of the Smart Inventory application. The three main subsystems of the Smart Inventory application are the user interface, machine learning model, and the database management. As the system has no physical, thermal, or electrical characteristics, this document will contain how each subsystem interfaces with the others as well as the software characteristics of the application.

2. References and Definitions

2.1. References

IEEE 0-8186-3570-3

Data quality requirements analysis and modeling
April 1993

IEEE 0-8186-3570-3

A language multidatabase system communication protocol
April 1993

IEEE 0162-8828

Framework for Performance Evaluation of Face, Text, and Vehicle Detection and Tracking in Video: Data, Metrics, and Protocol
31 March 2008

IEEE 978-1-4673-0242-5

App interface study on how to improve user experience
July 2012

IEEE 978-1-5386-5457-6

Machine Learning for Object Labeling
October 2018

IEEE 978-1-6654-2317-5

Designing an Inventory Database Software Suitable for Small Business
19 July 2021

2.2. Definitions

ML	Machine Learning
API	Application Programming Interface
GUI	Graphical User Interface
Database	A set of structured, digital data that is stored and accessed digitally.
Graphical User Interface	A visual form of a user interface that uses elements such as icons and menus for interacting with the user.
Image recognition	The process of identifying an object through previously images of the object.
Inventory	A list of all items that are contained within some classification.
Machine Learning	The use of a program that is able to learn from data that it receives through algorithms and data patterns.
User Interface	Some means by which a user interacts with software.

3. User Interface

3.1. Student UI

The student UI part is where the student can have access to the app like checking out or in equipment or making reservations before coming into the lab. This will interact with mostly the user database because that's where the student can make reservations and fill out forms.

3.2. Administrative UI

The administrative UI part is where the staff can have access to the app like using the forms, view checked outs, approve student checks you and in, account change notification and revising data. This part of the UI will mostly interact with the user database because the user database will include all the actions that the TA and other people account are allowed to use in the app.

4. Machine Learning Model

The Machine Learning (ML) model is responsible for taking an image of the lab equipment and adding a label/category to it. Using a database that link with the inventory it will be able to give the user the most updated information on the categorization of the equipment. To train the model a dataset will be created as well as a training set that will be used to check the accuracy of the model.

4.1. Machine Learning Database

The ML database will be responsible for holding all of the label information to tag the images. In order to do this effectively, it must cross-reference the inventory database to get the most updated information on the categorization of the lab equipment. From this database the ML model will read the tags and send the result to the user.

4.2. Datasets

There will be two dataset used for ML model. One dataset will be used to train the model so that it knows how and what to label images. This dataset will most likely be acquired by taking multiple images fo lab equipment and compiling it into something that the model can use. The second dataset will be used to validate the functionality of the model by acting as a testbench. With these images it is possible to check the accuracy of the model and make adjustments to its complexity.

5. Database Management

The database management system handles all of the inventory data for the application. This subsystem parses through, creates, and deletes information stored in both the user

and inventory database when given commands from the UI or the ML model. These commands are defined in the database functions.

5.1. Database Functions

The database functions subsystem will act as a library of defined functions used to navigate and manipulate both the user and inventory databases. This set of functions will be the way that the databases interact with the ML model and the UI. The UI will call database functions with specific parameters dependent on the user and what they have selected in the UI. These functions will parse through both databases and return any relevant information as well as changing some of the data entries if the function called requires such.

The database functions as the interaction point between the inventory database and the ML model. When the ML model identifies an inventory item it will call a database function with the item ID as the parameter. The database function will then find all of the information relevant to that item and send it to the UI to be displayed.

5.2. User Database

This database will contain all the information relevant to a registered user account. This database will only ever interact directly with the database functions which act as a bridge between the database and the rest of the application. Indirectly this database interacts much with the UI, one main interaction is the database stores the information on which UI to display.

5.3. Inventory Database

Like the user database, the inventory database will only interact directly with the database functions. Unlike the user database the inventory database interacts indirectly with both the UI and the ML model. The ML model calls an inventory database function when it identifies an object.