

POINT OF SALE GROCERY CART

Design Team 6

Facilitator

Dr. Jian Ren

Team Members

Steven Hartz

Matt Rasmussen

Ben Lauzon

Shuangfei Liu

Husain Aleid

Toaping Zhu

Sponsor

Dr. Satish Udpa

OUTLINE

1. Goals
2. Design Specifications
 - I. Hardware
 - II. Software
3. Final Design
4. Future Improvements
5. Demonstration

GOALS

- Reduce retailing cost
- Greatly reduce the long waiting queues
- High life expectancy, rugged design
- User-friendly, intuitive

DESIGN SPECIFICATIONS

A. Hardware

- Shopping cart equipped with a load cell that weighs items
- Interface electronics that communicates with a smartphone

DESIGN SPECIFICATIONS

B. Software

- Smartphone Application capable of scanning UPC code
- Allow a user to add item to list only if weight matches
- Report an error to the smartphone if weight does not match
- Self-checkout using the smartphone

DESIGN COMPONENTS

- Motorola 3000mAh portable USB charger
- Accuteck postal scale
- Scale circuit
- Arduino Yun
- Server

FINAL DESIGN - OVERVIEW

- Load Cell output used by microcontroller to calculate weight
- Central server acts as intermediary between phone and cart microcontroller
- Cart components powered by battery, charged wirelessly when cart is docked

FINAL DESIGN

A. Wireless Charging Battery

- 3000 mAh
- Placed on the back of the cart
- Supplies power to the load cell and the Arduino Yun
- Recharges automatically on the charging mat
- Provides 10 hours of battery life on single charge

FINAL DESIGN

B. Load cell

- One load cell measures up to 65 pounds
- Resolution of 0.2 oz
- Placed under the center of the cart
- Outputs voltage to Arduino

FINAL DESIGN

C. Arduino Yun

- Reads amplified voltage from the load cell
- Reports items' weights to the server

FINAL DESIGN

D. Smartphone Application

- Scanning UPC code
- Option to enter 4-digit PLU code
- Communicating with the server
- Listing items and prices
- A feature of deleting items
- Checkout using PayPal

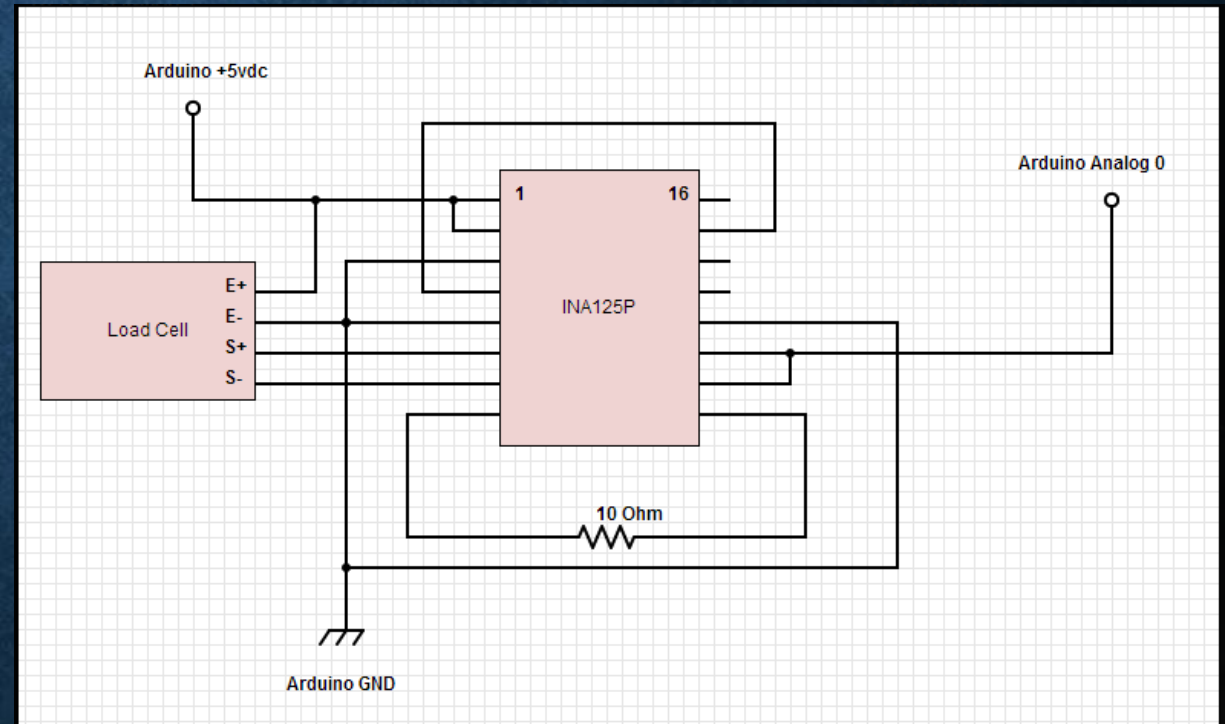
FINAL DESIGN

E. Server

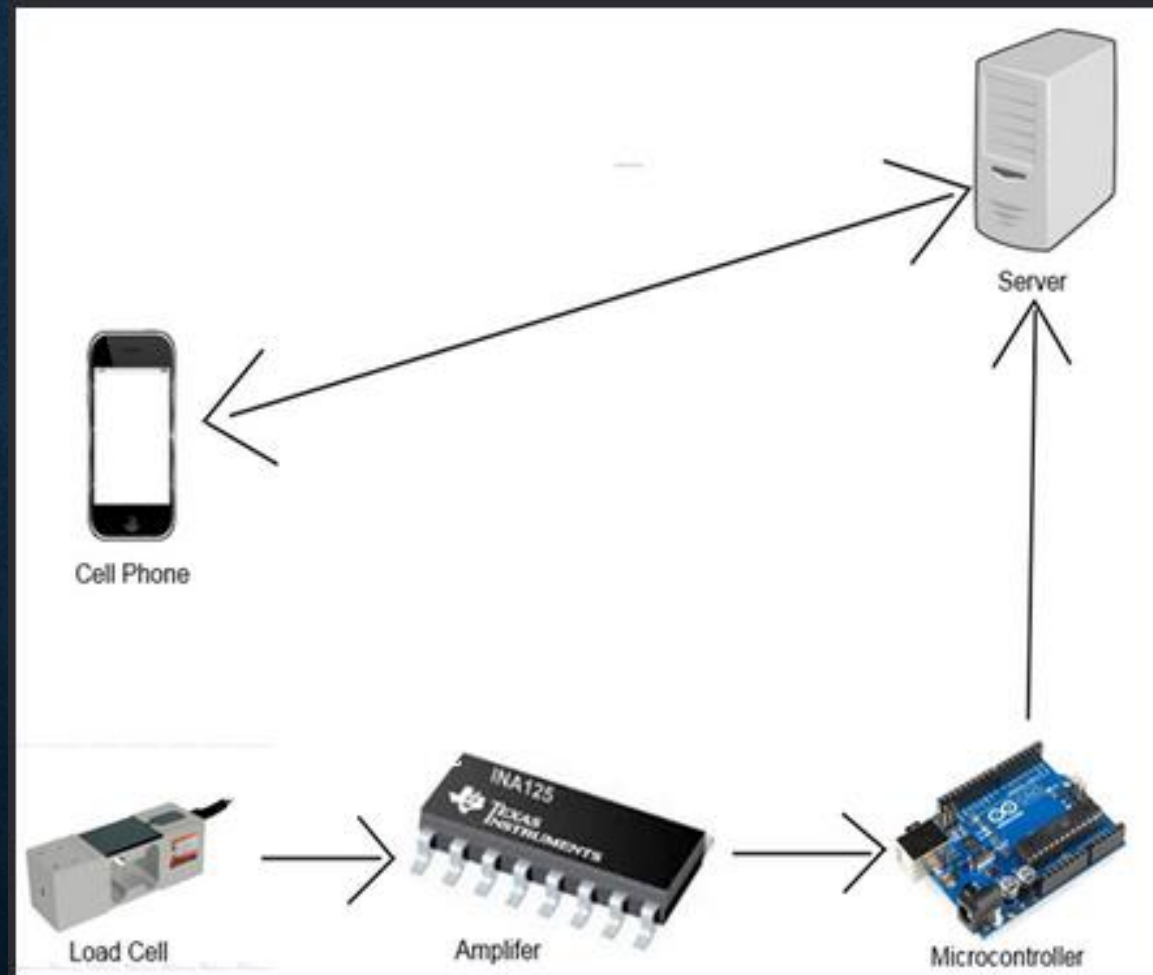
- Acts as secure intermediary between app and cart
- Stores items' weights and prices
- Return product information to customer's smartphone
- Alert store employees to potential thefts

SCALE CIRCUIT

- INA125p amplifier
- Excitation and source wires
- Circuit output is connected to Arduino input
- Resistor regulating the maximum voltage



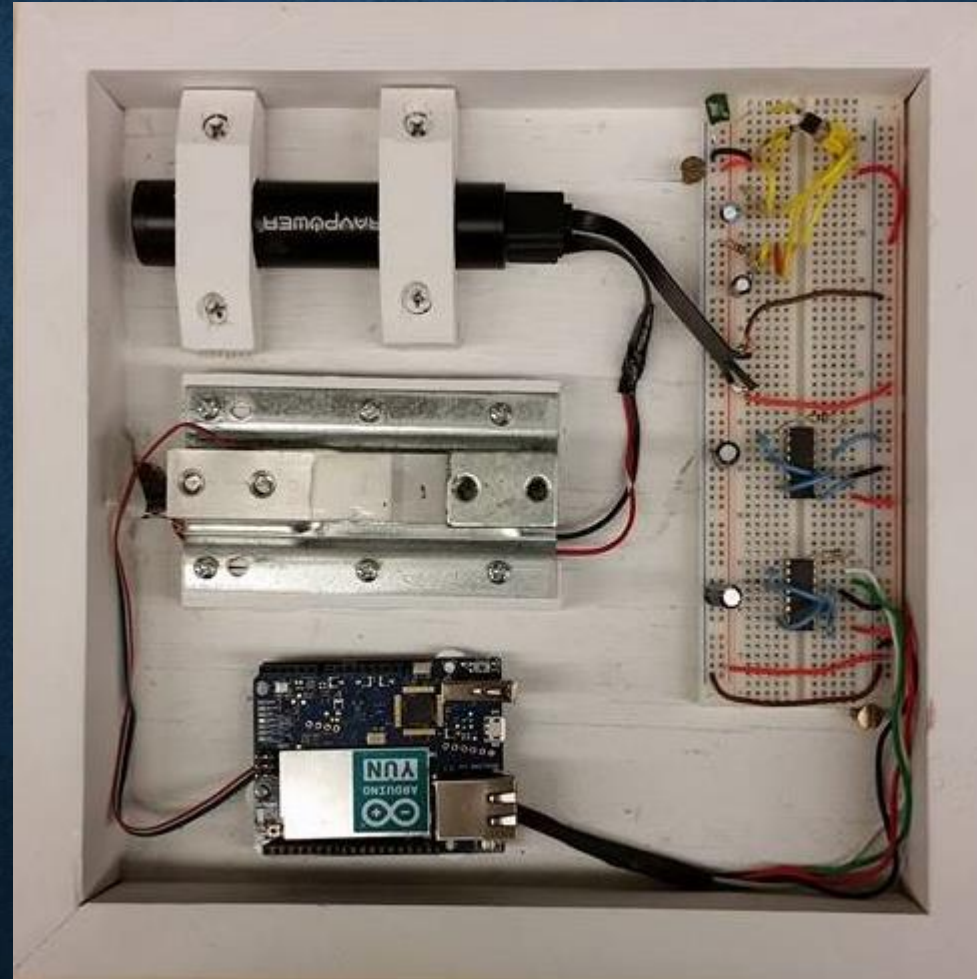
PROCESS OF ONE ITEM PURCHASE



FUTURE IMPROVEMENTS

- Identifying items through image processing
- Customer's location feature
- Applying electronic coupons
- Adding one more load-cell
- Electronic receipts
- Private-Key cryptography on cart-server interaction

SHOPPING CART PROTOTYPE

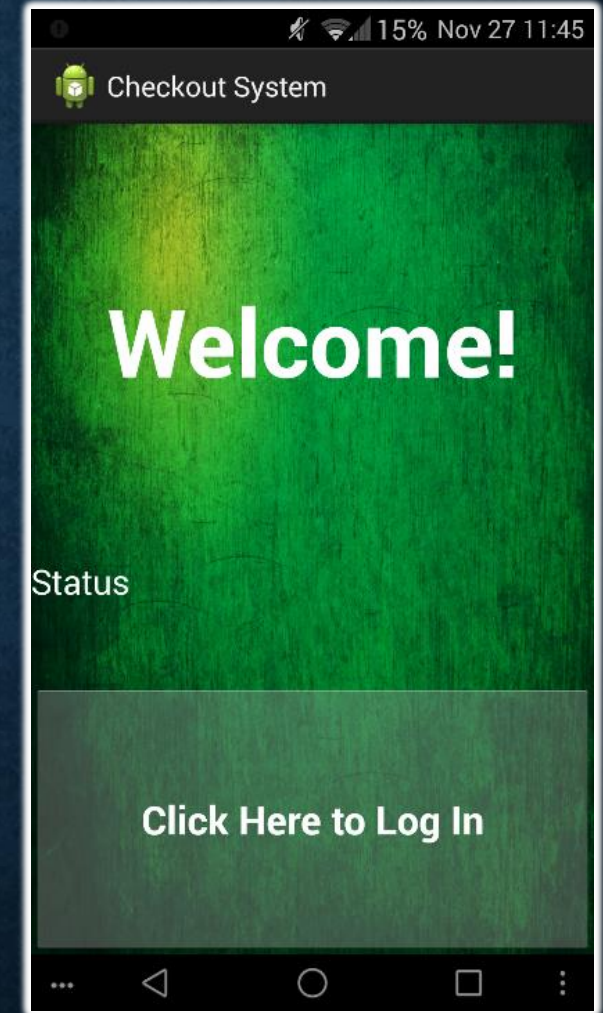
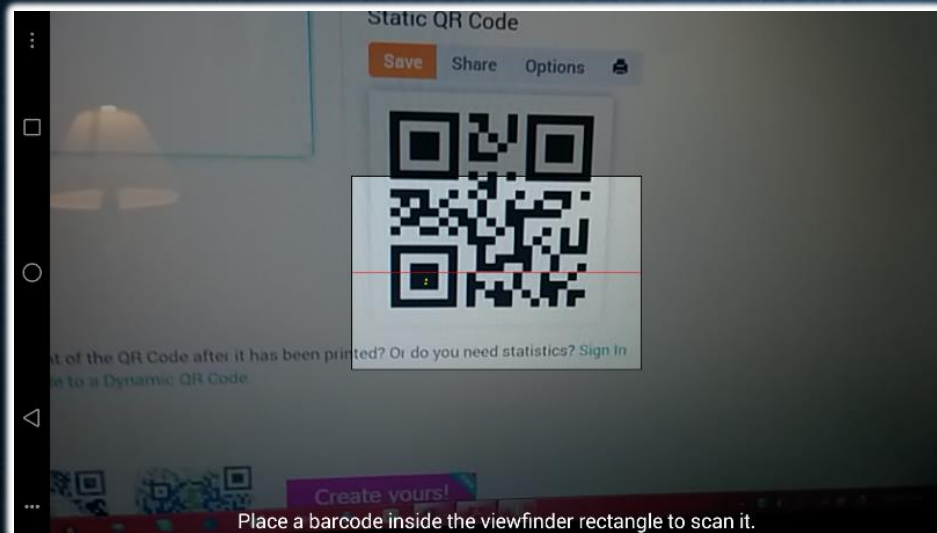


DEMONSTRATION

DEMONSTRATION

Initial Login Page

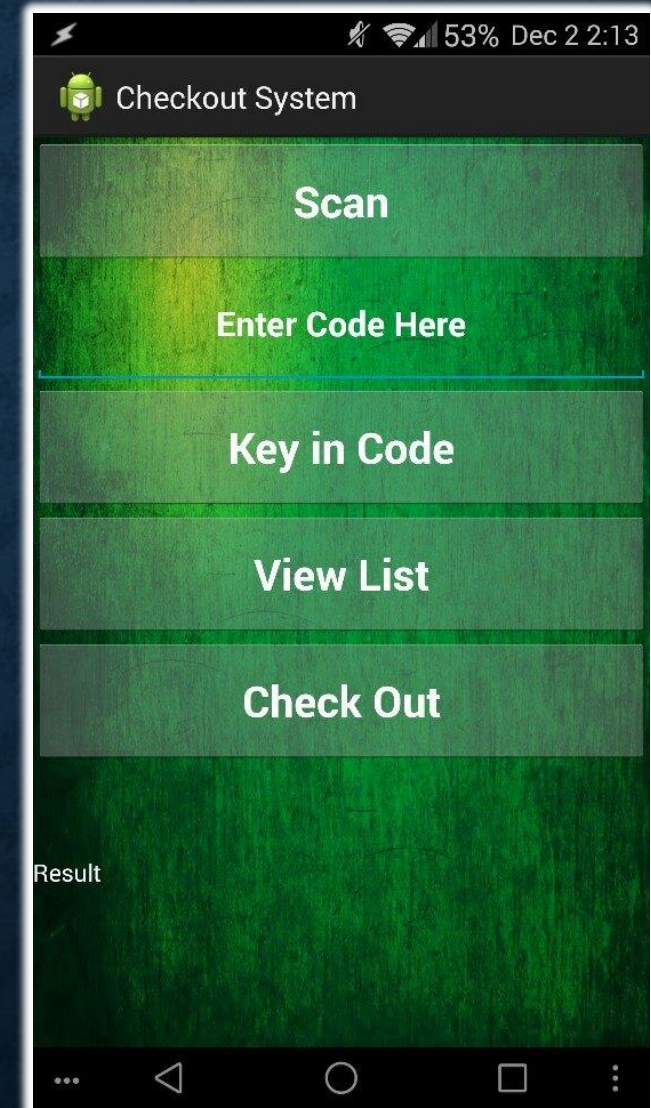
1. User launches application from home-screen
2. Presses login button to sync with cart
3. Uses rear-facing camera, and places QR code within on-screen box
4. Scanned QR code is sent to the server
5. If an open, valid cart is scanned, the user is redirected to the main menu, if invalid, a warning message appears



DEMONSTRATION

Main Menu

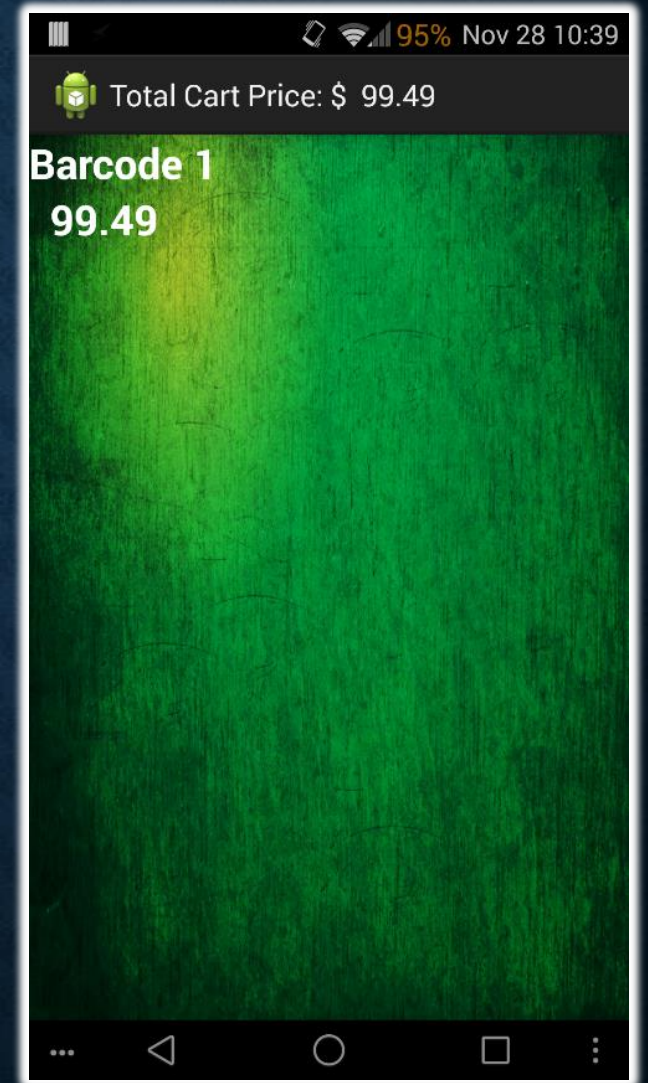
1. User presses the “Scan” button to add a new item.
2. Can also key in a PLU code from an item using “Key in Code”
3. “View List” allows the user to see what items they have already added to their list
4. When finished shopping, the user selects “Check Out” to pay for their items and close their session
5. Result at the bottom displays the last code scanned in



DEMONSTRATION

New Item is added

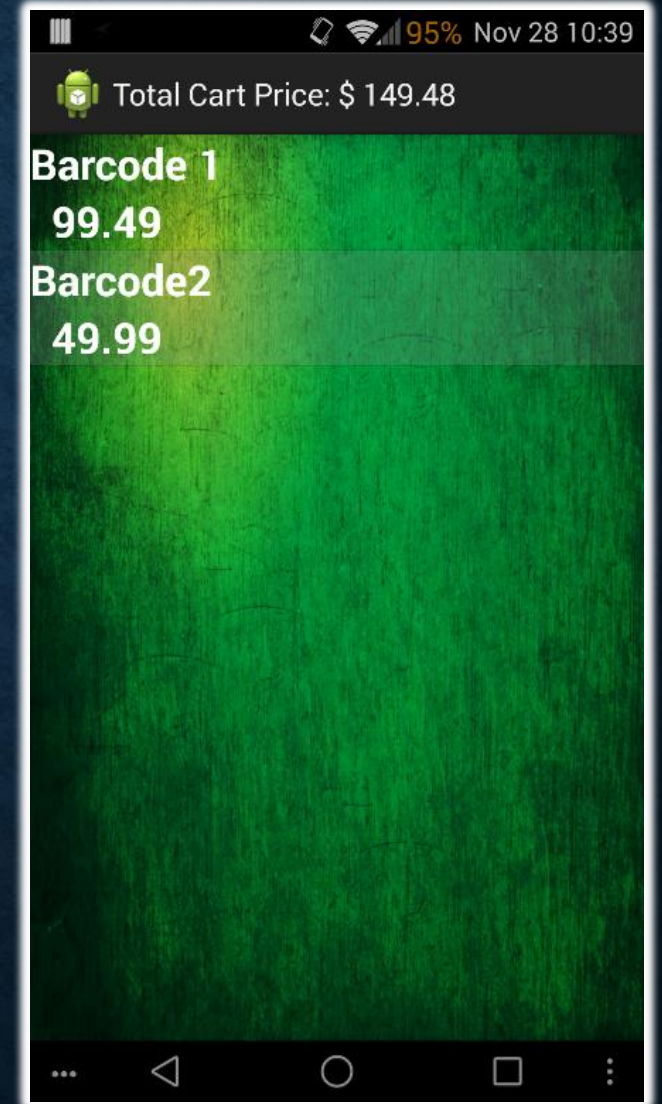
1. Upon a successful scan, the UPC is sent to the server to verify the new cart weight
2. If item weight is verified to be correct, item is added to the shopping list
3. An incorrect weight will result in an error popup, and will not add anything to the list
4. Item added via PLU code input will enter the list with a variable weight amount, depending on the size of the item added



DEMONSTRATION

Item is removed

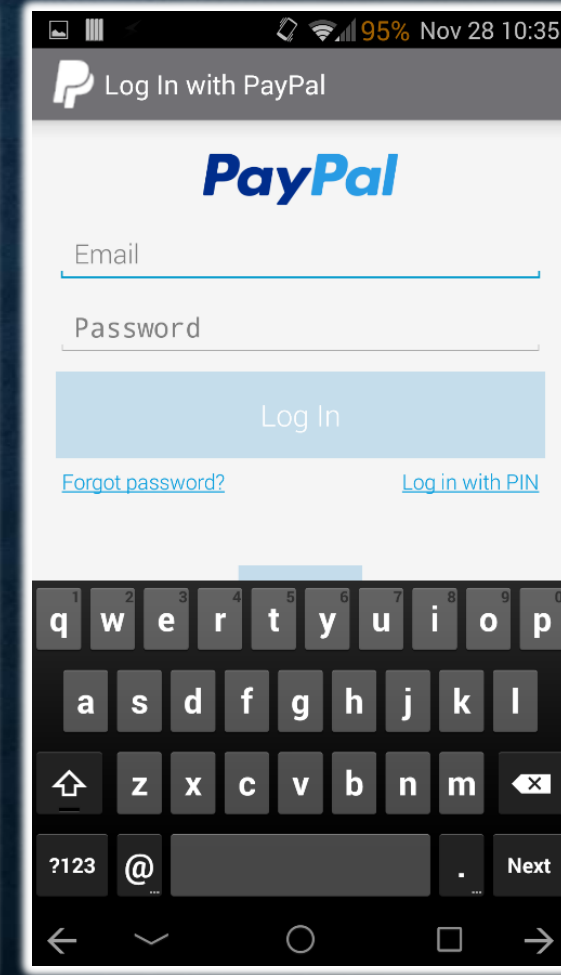
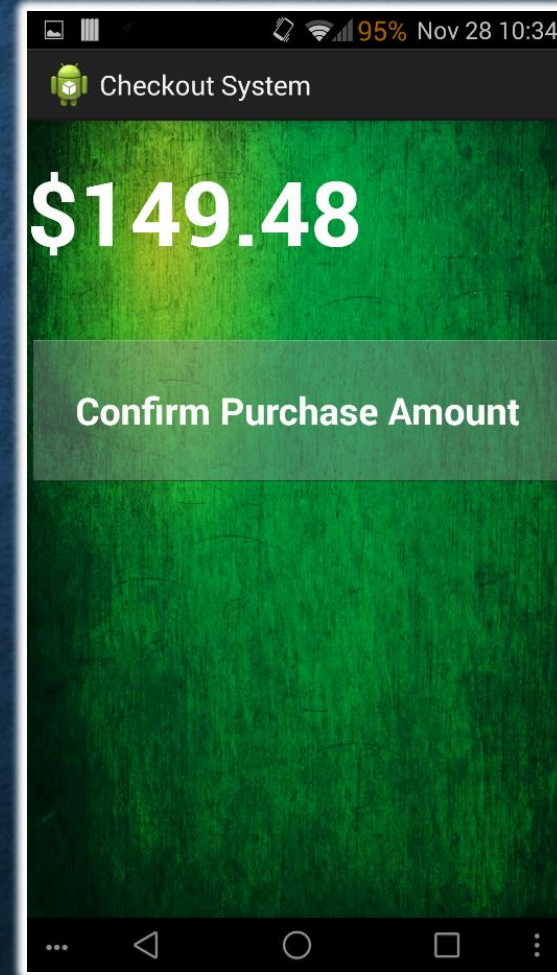
1. If the user decides they no longer want an item, it can be removed by long-pressing said item
2. Supports removal of multiple items at a time, granted the new cart weight is verified to be correct
3. Upon correct verification of new weight from server, item is removed from list and the total price is updated
4. If item is not actually removed from the cart, or the new total weight is not consistent with the items, the item will not be removed, and an error message will appear



DEMONSTRATION

Paying for Items

1. Once the user has gathered all their items, the “Check Out” button must be pressed
2. Here the user can confirm that the total amount is correct
3. Finally, the user can log in to PayPal to submit a payment in that amount



QUESTIONS?