Electronic Parking Meter Station

IE 577
December 3 2012

Agenda

- Introduction
- Current Designs
  - General Overview of Atlanta Meter
  - Analysis Review
- Proposed Design
  - Requirements
  - Hardware
  - Software
- Experiment
- Conclusion

Introduction

- “This machine is smarter than me!”
- New types of payment
  - New mental models = new opportunities for confusion
  - Non-standard
- Opportunities
  - More revenue
  - Better enforcement
- Costs
  - Costs to drivers – frustration, tickets
  - Costs to municipalities – lawsuits, lost revenue

Current State – Meter Types

- Coin operated
  - Standardized
  - One payment option (coins)
  - Administration costs escalating

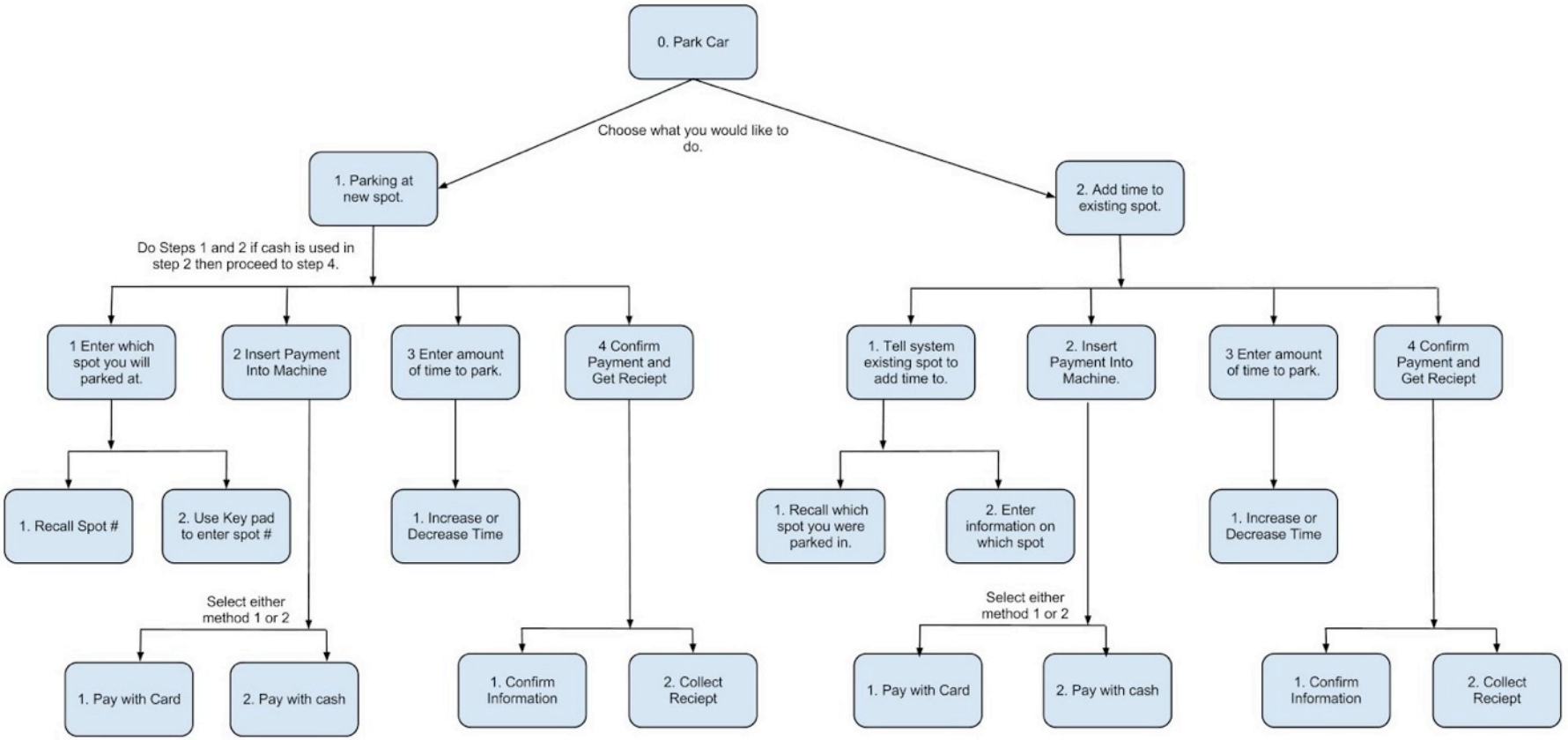
- Kiosk-based Pay Stations
  - Multiple designs
  - Offer multiple payment options
  - Reduced operating costs for cities and municipalities

Atlanta Meter Design

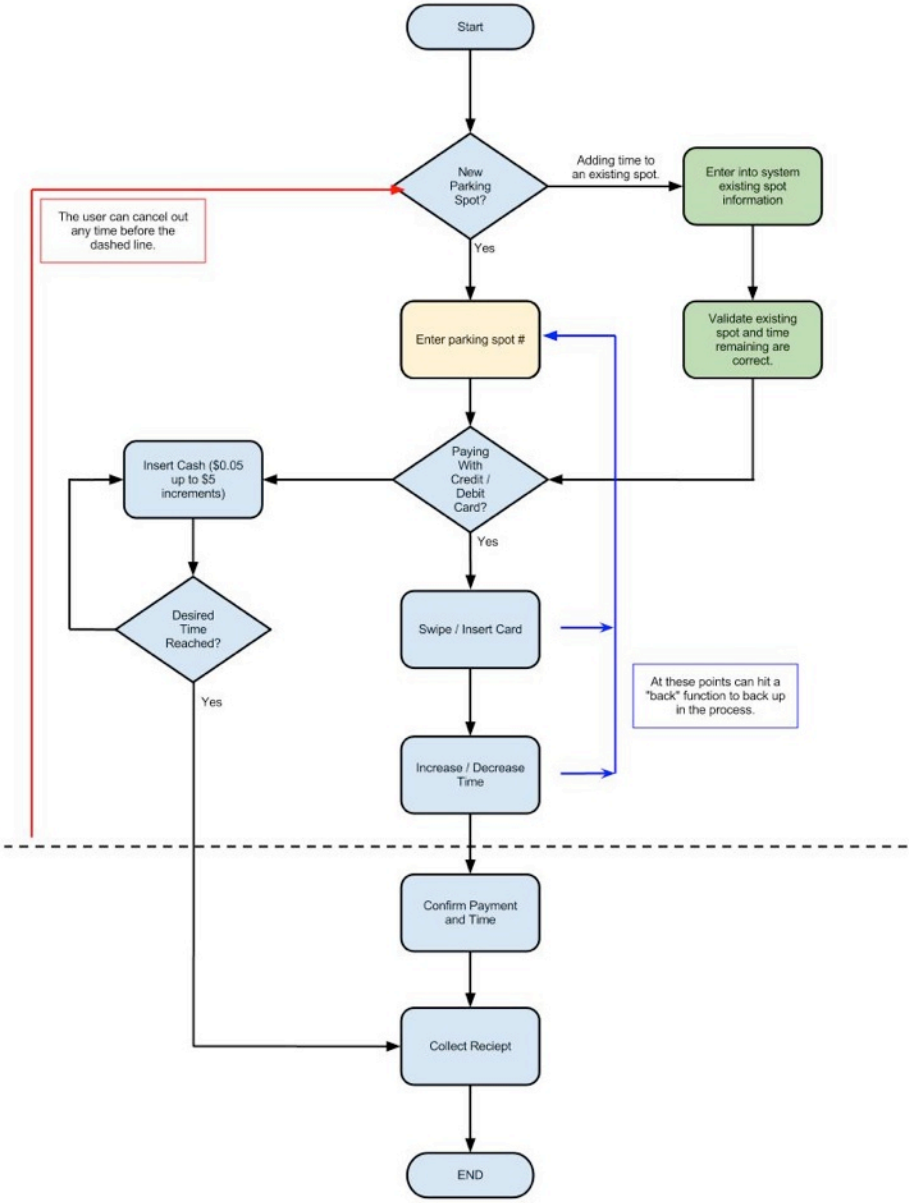
- Kiosk, pay-by-space

Atlanta Meter Design

Task Analysis – Atlanta Meter



Task Analysis – Atlanta Meter



Usability Study – Atlanta meter

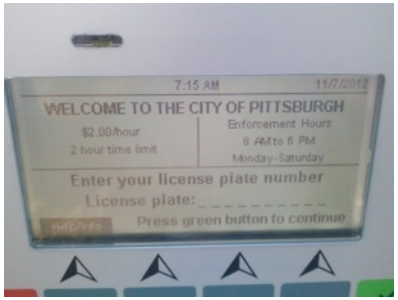
- Heuristic Analysis completed
  - Task Understanding
    - User required to remember parking space number
    - No clear user feedback on transaction steps
    - Desire to quickly complete transaction
  - Kiosk operating conditions
    - Environmental factors (lighting, weather)
    - Overcomplicated user experience

Kiosk Design Options

- Pay and display

- Pay by space

- Pay by license plate



Proposed Design – Pay and Display

- Benefits
  - Simple – No need to keep knowledge in the head
  - Don't require user to remember spot or license plate
  - Increases curbside space utilization
  - Easier monitoring in inclement weather conditions
    - No need to keep space numbers visible

- Disadvantages
  - Requires user to go back to car to display receipt
  - Cannot add time remotely
  - Slower process for enforcement

Modality

- Two possible uses for audio (speech):
  - Use speech as alternate input method
  - Use voice instructions to guide the users

- Conclusions
  - Voice as input method not well accepted
    - Privacy
    - Reliability
  - Voice guided instructions don't give any performance gain
    - Could actually increase cognitive load

User Characteristics

- Primary User: Payee
  - Consider Driver as primary user
  - Passengers could be anybody
- In Iowa (typical for US):
  - At least 16 y/o to drive alone
  - 20/40 corrected or uncorrected, 115 deg FOV in one eye
  - No hearing requirements
  - No physical requirements legally, must be able to operate
  - Cognitive: able to pass the driver's exam

System Requirements

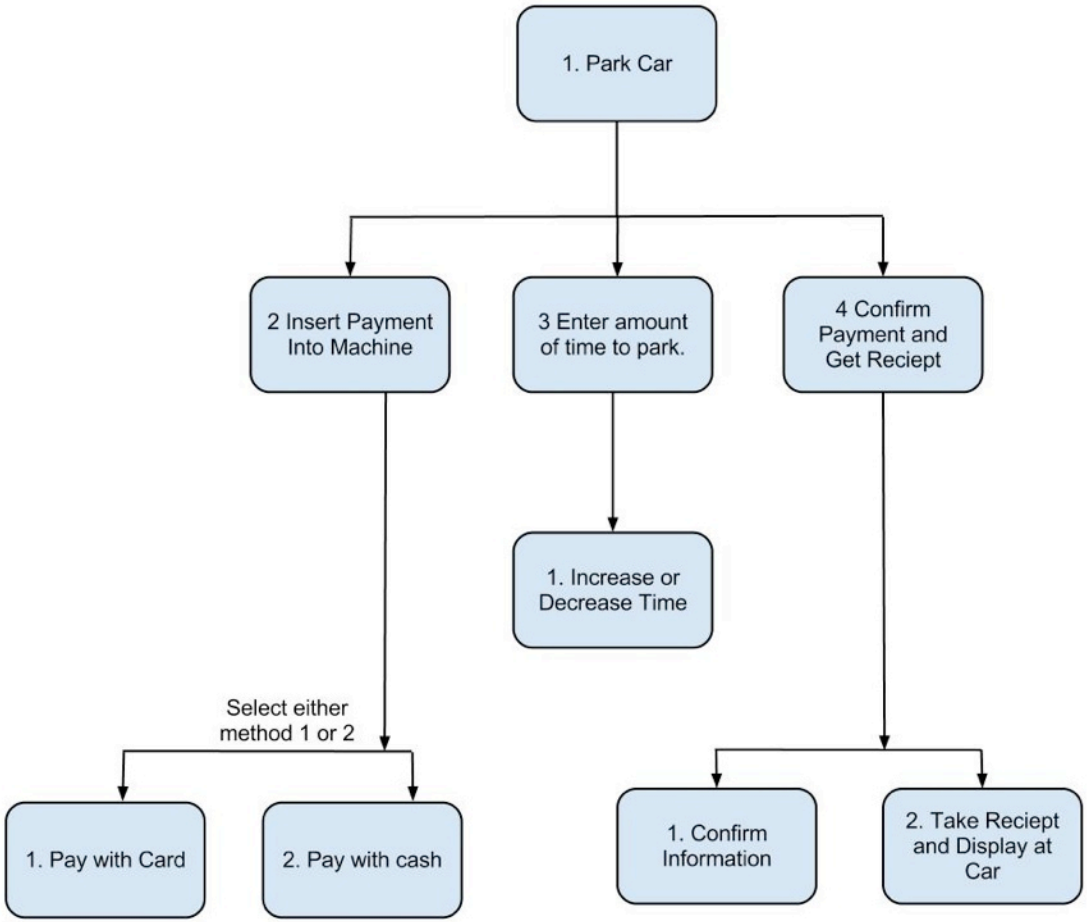
- Improved User Experience
  - Easy to use
  - Simple
  - Immediate feedback
- Support Multiple Payment Transactions
  - Cash
  - Credit Card
- Environmental Factors
  - Illumination
  - Outdoor environment (rain, snow)

Hardware / Software

- Hardware:
  - Leverage existing kiosk designs
    - Airport check-in, Bank ATM, Video Rental (Red Box)
  - Touch screen
  - Card reader
  - Printer

- Software
  - Optimize response time
  - Font size
  - Minimize scrolling

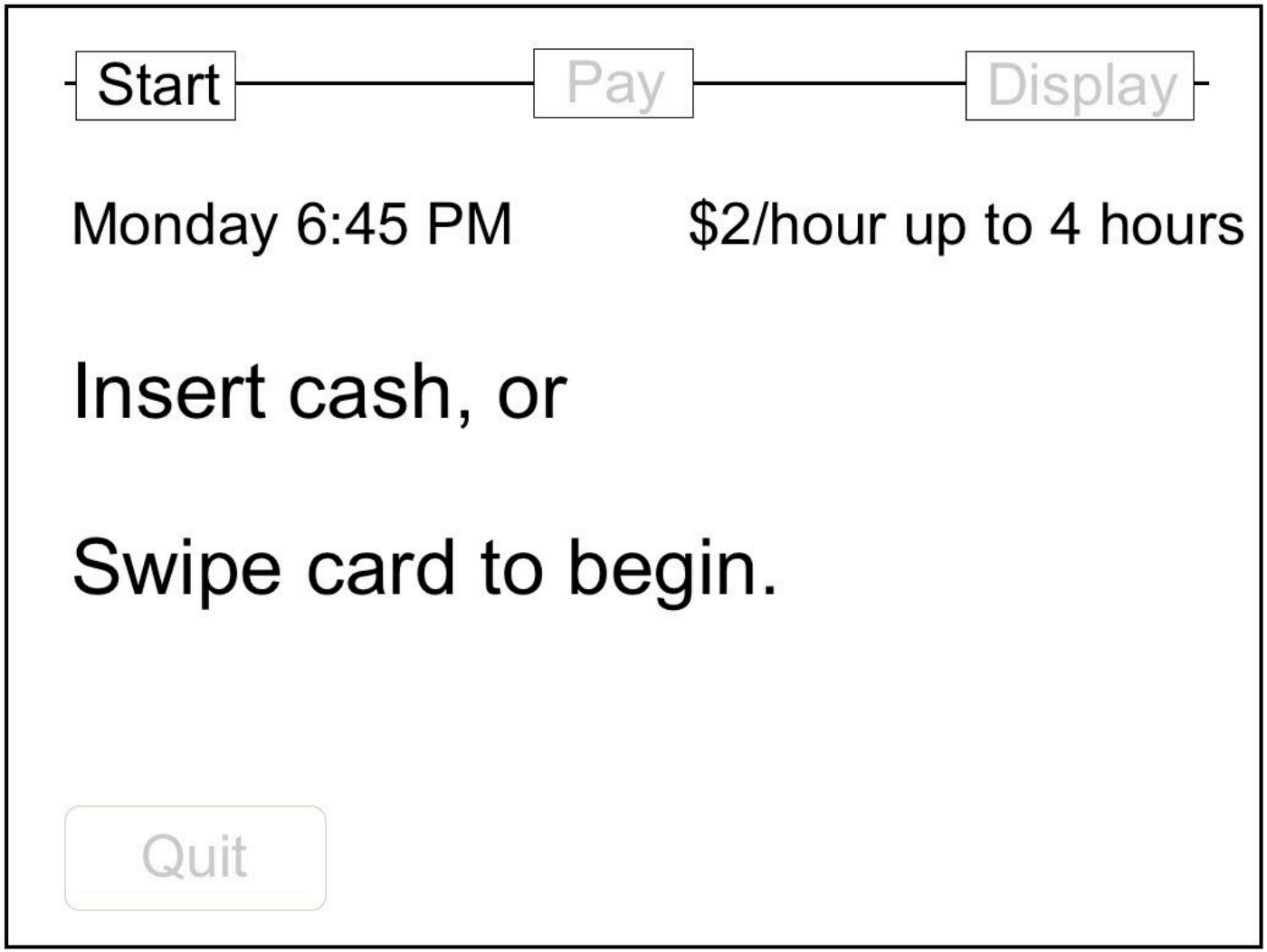
Task Analysis – New Design



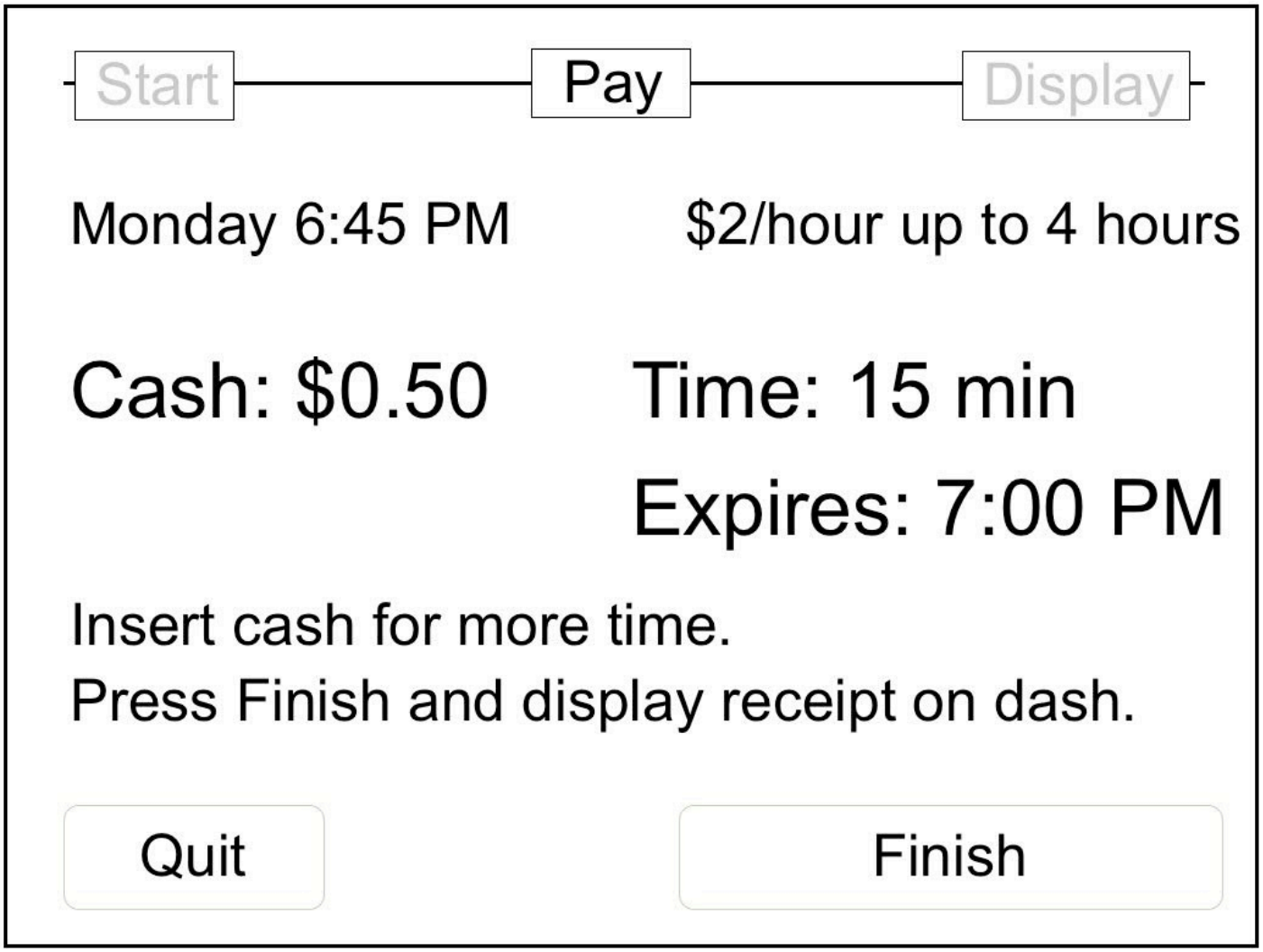
Instructions and Process Flow

- Research on Kiosk and ATM design
  - (Maguire 1999; Coley et al., 1997; Akwera, 2009; Zimmerman, 2000)
- Instructions
  - Simple, on screen instructions
  - Time, lack of inclination to read
- Process Flow
  - Show Progress
  - Standardize button locations
  - Single question per screen
  - No key steps after main goals completed

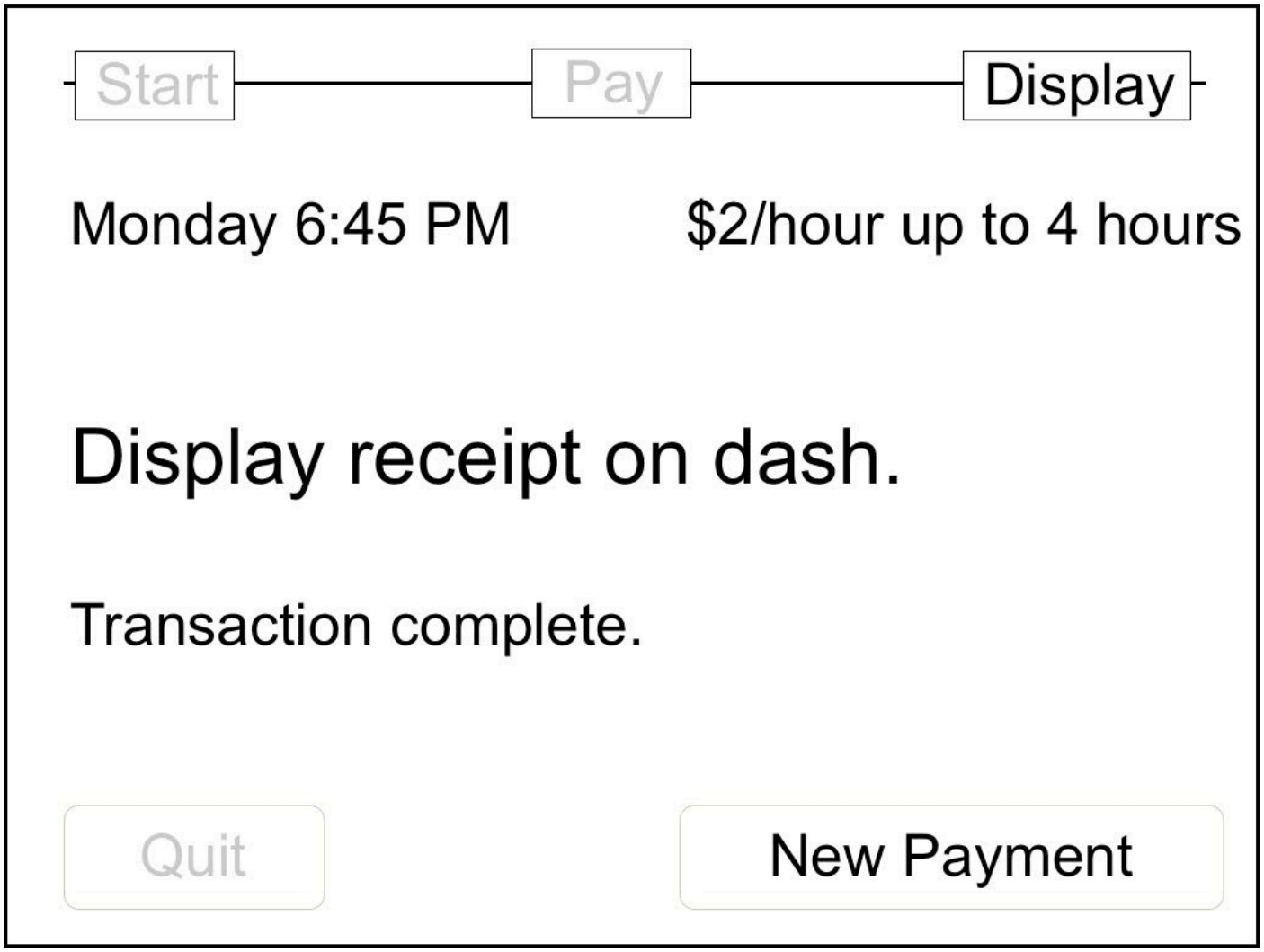
Prototype – Start



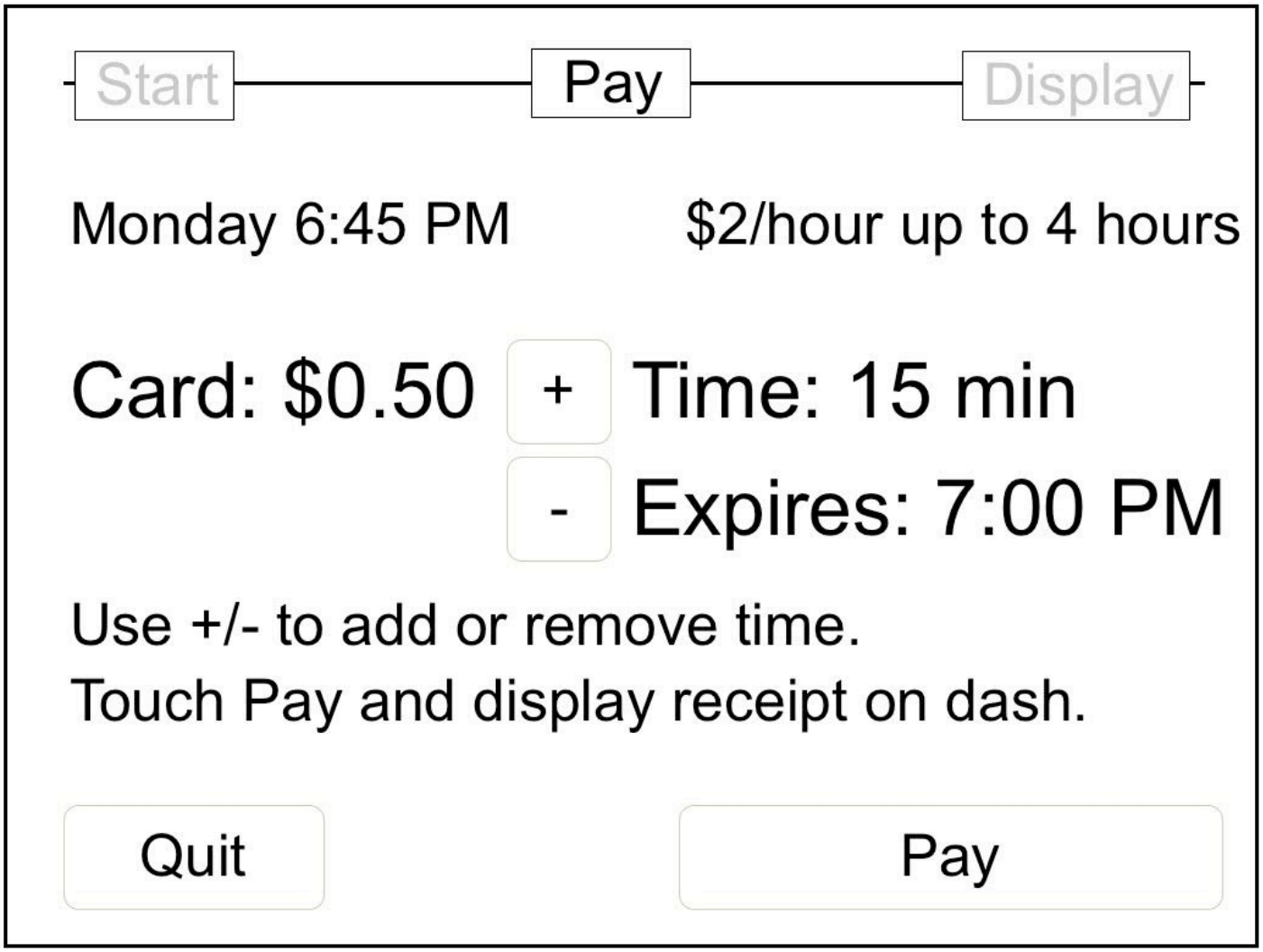
Prototype – Cash Payment



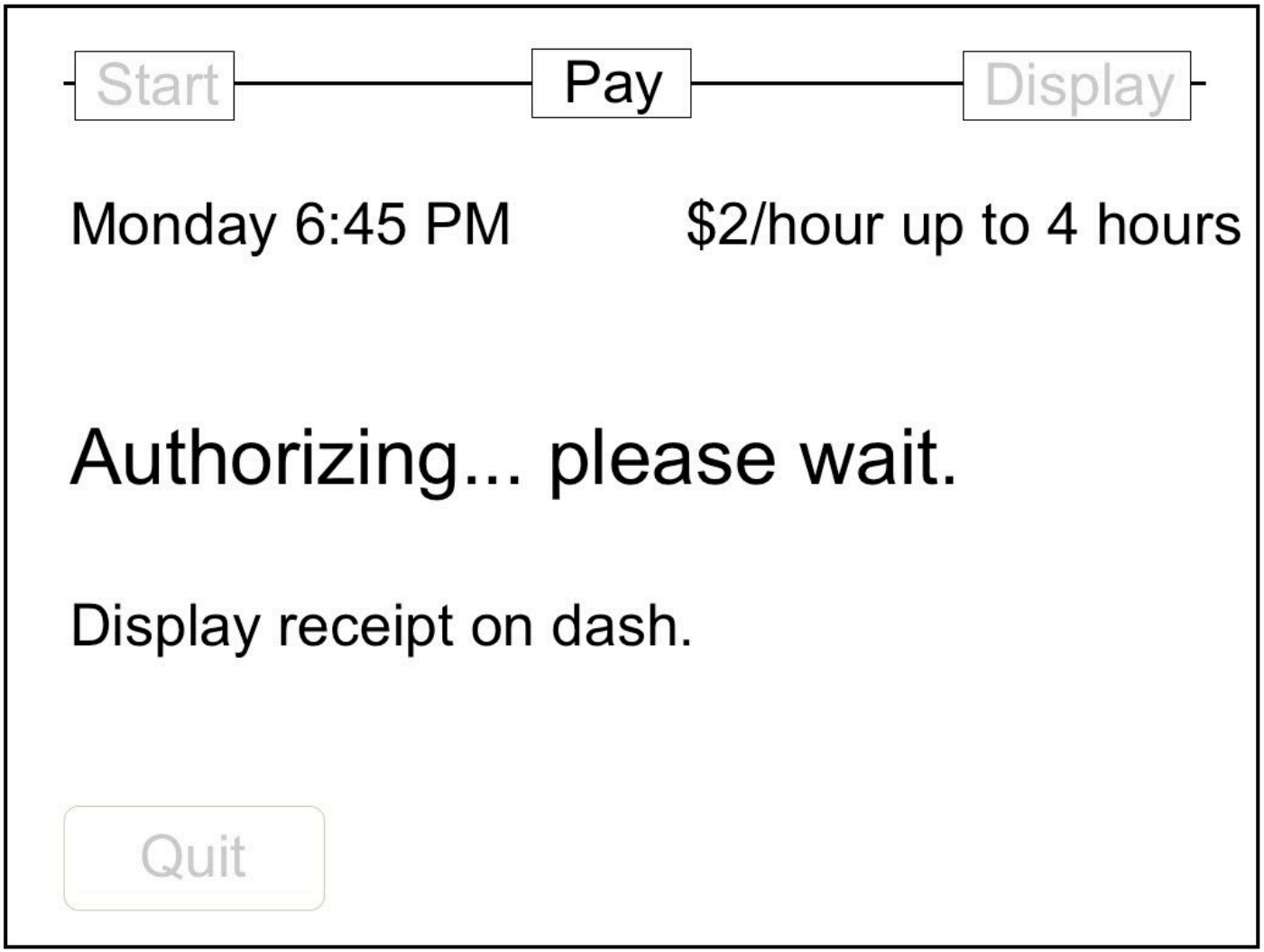
Prototype – Cash Display Transaction



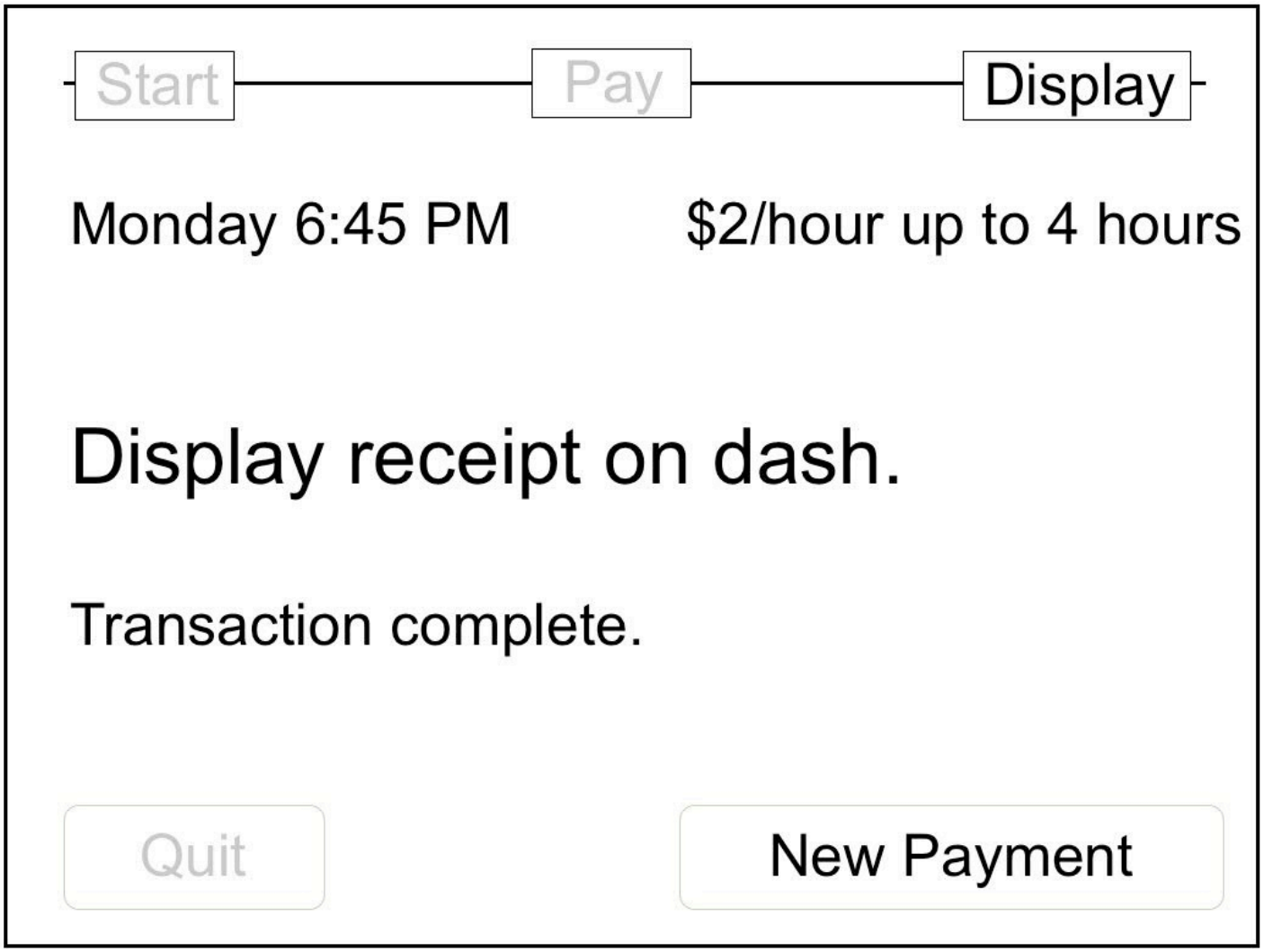
Prototype – Credit Card Payment



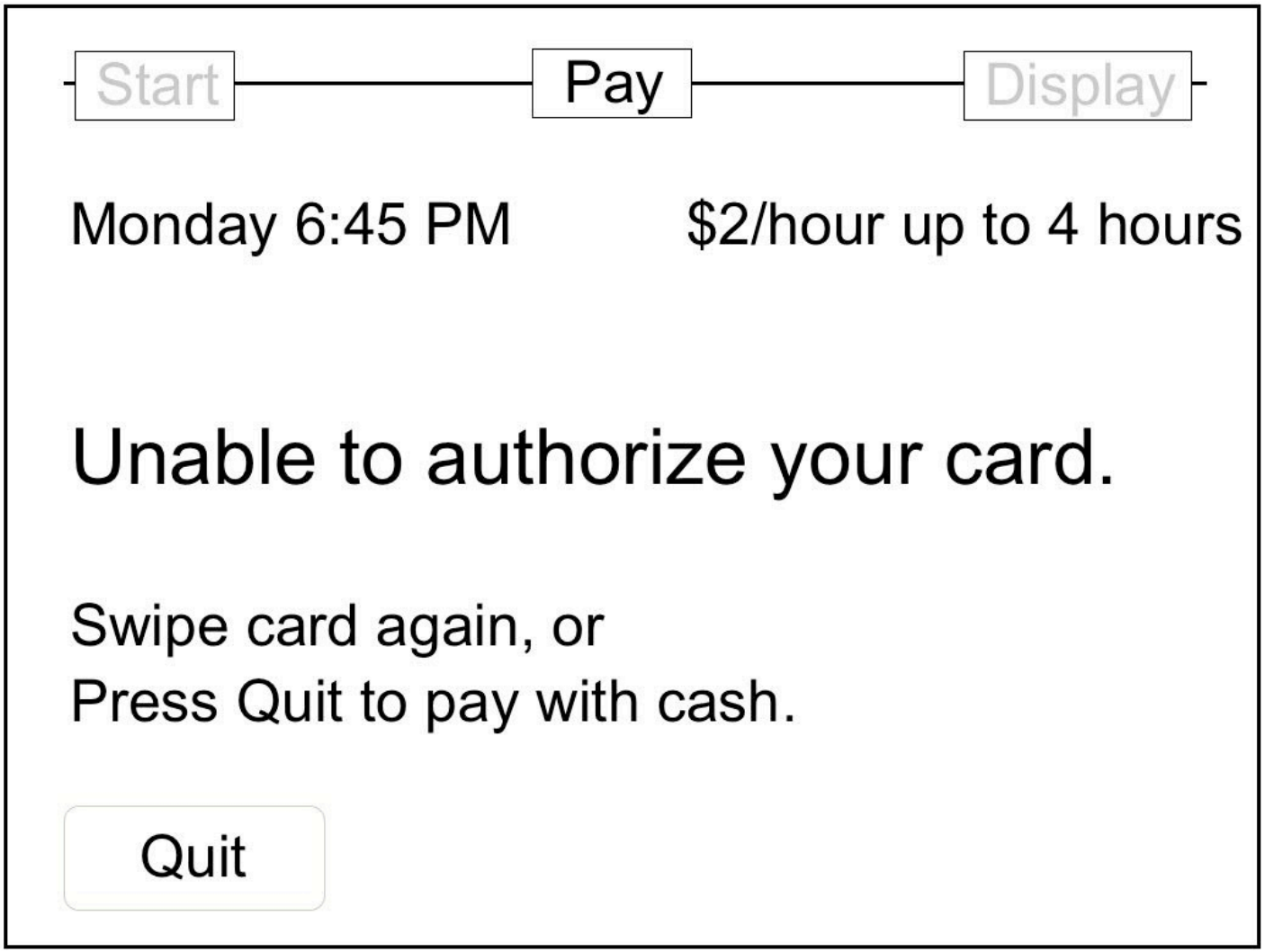
Prototype – Credit Card Authorization



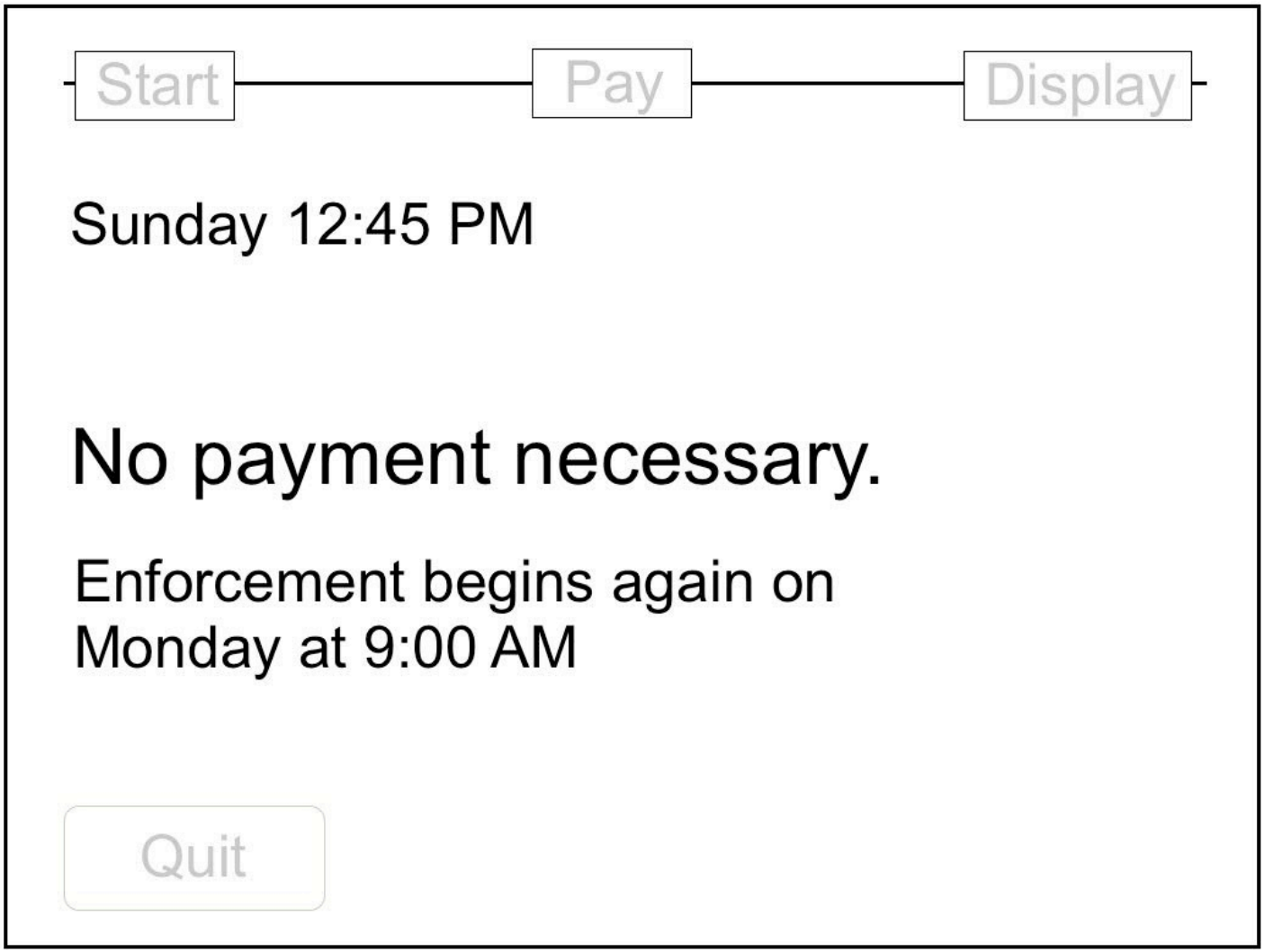
Prototype – Authorization Success



Prototype – Authorization Error



Prototype – Unenforced Time



Experiment

- Two group design
  - Controlled environment
- Independent Variable
  - User Interface of the two kiosk parking systems
- Dependent Variables
  - Time it takes to complete process flow.
  - Number of errors made during the process.
  - Survey on level of ease of use with fixed questions for all subjects.

Conclusion

- Simpler more efficient design
- Improve user payment experience at kiosk
- Technological advances continue to allow new features but not necessarily improve user experience