BRIEF OVERVIEW OF EACH INTERFACE USED IN THE STUDY:

TEXT MESSAGING SERVICE:
Users can activate a text-message service to be notified when their meter has 2 minutes remaining.
Users can also text their meter key #, their parking meter # and how many quarters they wish to have deducted from their key and added to their meter by texting this information to Parking Facility number.

On Parking Meter:

10 HOUR TIME LIMIT
HOURS: 6 AM – 9PM
Daily Except Sunday
Nickel: 4 min  Dime: 8 min
Quarter: 20min

To receive a text-message when your meter runs low, text:
Your parking meter # (666)
to (217) 123-4567.

To refill your meter, text:
Your key # and
Your parking meter # (666)
How many quarters (20min) you wish to add
to (217) 123-4567

PRE-RECORDED CALLING SERVICE
Users can choose to receive a phone call when their meter has 2 minutes remaining. When receiving this phone call, users will be prompted with options such as: refill meter, check meter key balance, check meter balance. The user can also call the Parking Facility number on the meter to do any of the options previously stated.

On Parking Meter:

10 HOUR TIME LIMIT
HOURS: 6 AM – 9PM
Daily Except Sunday
Nickel: 4 min  Dime: 8 min
Quarter: 20min

To receive a phone call when your meter runs low, text:
Your parking meter # (666)
to (217) 123-4567.

To refill your meter, call:
(217) 123-4567
NARRATIVE OF EACH TASK PROVIDED TO USERS:

TEXT MESSAGING SERVICE:
Users were asked to:
1) Activate a text-message reminder
2) Add 80 minutes to their parking meter, by using text-messaging

You have just parked your car in a metered spot. You get out of your car and approach the meter to insert change. Upon reaching the meter you see the following message on it:

<table>
<thead>
<tr>
<th>10 HOUR TIME LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOURS: 6 AM – 9PM</td>
</tr>
<tr>
<td>Daily Except Sunday</td>
</tr>
<tr>
<td>Nickel: 4 min</td>
</tr>
<tr>
<td>Dime: 8 min</td>
</tr>
<tr>
<td>Quarter: 20min</td>
</tr>
</tbody>
</table>

To receive a text-message when your meter runs low, text:
Your parking meter # (666) to (217) 123-4567.

To refill your meter, text:
Your key # and
Your parking meter # (666)
How many quarters (20min) you wish to add
to (217) 123-4567

Task #1) Activate text-messaging reminder.

Please show exactly what your text looks like:

To: 

Message:

(time passes)

You receive a text message from the Parking Facility saying that your meter will expire in 2 minutes.
Task #2) Add 80 minutes to your parking meter.
Your key number is 445566.
Your meter number is 666.

Please show exactly what your text looks like:

To: 

Message: 

You receive the following text-message confirming your request:

Meter# 666
Key# 445566
Add 80 minutes.
(Reply back “Yes” to confirm)

Please show exactly what your text looks like:

To: 

Message: 
PRE-RECORDED CALLING SERVICE:

Users were asked to:

1) Activate a phone call reminder
2) Add 80 minutes to their parking meter, by using pre-recorded phone calling service

You have just parked your car in a metered spot. You get out of your car and approach the meter to insert change. Upon reaching the meter you see the following message on it:

```
10 HOUR TIME LIMIT
HOURS: 6 AM – 9PM
Daily Except Sunday
Nickel: 4 min   Dime: 8 min
Quarter: 20min

To receive a phone call when your meter runs low, text:
Your parking meter # (666) to (217) 123-4567.

To refill your meter, call:
(217) 123-4567
```

**Task #1) Activate calling reminder.**

Please show exactly what your text looks like:

To: _______________________

Message: ________________________________

*(time passes)*

You receive a call from the Parking Facility:
Pre-recorded message:

Your parking meter will expire in 2 minutes.
To refill your meter, press 1.
To check your meter balance, press 2.
To check your key balance, press 3.
To speak to a Parking Facility employee please wait on the line and your call will be transferred.
Thank you.

Task #2) First, check your key balance.
Your key number is 445566.

(after you enter “3”)

Pre-recorded message:

Please enter your key number followed by the pound sign.
To return to the main menu, press 0.

(after you enter “445566”)

Pre-recorded message:

You have entered key number 445566. If this is correct, press 1.
To reenter your key number, press 2.
To return to the main menu, press 0.

(after you enter “1”)

Pre-recorded message:

Your current key balance is seventeen dollars and fifty cents.
To return to the main menu, press 0.

(after you enter 0)
Pre-recorded message:

Your parking meter will expire in 2 minutes.
To refill your meter, press 1.
To check your meter balance, press 2.
To check your meter key balance, press 3.
To speak to a Parking Facility employee please wait on the line and your call will be transferred.
Thank you.

**Task #3)** Add 80 minutes to your meter.
Your key number is 445566.
Your parking meter number is 666.

*(after you enter 1)*

Pre-recorded message:

Please enter your key number followed by the pound sign.
To return to the main menu, press 0.

*(after you enter “445566”)*

Pre-recorded message:

You have entered key number 445566. If this is correct, press 1.
To reenter your key number, press 2.
To return to the main menu, press 0.

*(after you enter “1”)*

Pre-recorded message:

Please enter your meter number followed by the pound sign.
To return to the main menu, press 0.

*(after you enter “666”)*
Pre-recorded message:

You have entered key number 666. If this is correct, press 1.
To reenter your parking meter number, press 2.
To return to the main menu, press 0.

(after you enter “1”)

Pre-recorded message:

Please enter the number of quarters you wish to add to your meter.
To return to the main menu, press 0.

(after you enter “4”)

Pre-recorded message:

You have entered 80 minutes. If this is correct, press 1.
To reenter your parking meter number, press 2.
To return to the main menu, press 0.

(after you enter “1”)

Pre-recorded message:

Your current meter balance is 82 minutes.
To return to the main menu, press 0.
SCRIPT READ AT BEGINNING OF SURVEY:

We are currently enrolled in CS465 (Principles of User Interface Design). For our class project, we are working on implementing a more efficient and informative parking meter.

In this study we will be evaluating the most efficient way for users to be notified that their meter is running low and the most efficient way to refill their meter without having to actually walk up to it.

You will first be given a demographic survey and then several tasks to complete. After you complete the tasks, you will be given another survey asking you questions about the specific tasks you had to perform.

You will be given two different scenarios with different task that you must complete. Please do your best to simulate completing these tasks as you would if you were actually interacting with these parking meters.

The two different scenarios will consist of using a text messaging service and a pre-recorded phone calling service.

Feel free to ask any questions throughout the survey. Are there any questions at this time?

Thank you so much for your time!
QUESTIONNAIRE FORMS:

PARKING METER DESIGN
SURVEY I

Age:
☐ 16-25
☐ 26-35
☐ 36-46
☐ 46-56
☐ 57 and over

How often do you use parking meters?
☐ More than 4 times a week
☐ 1-3 times a week
☐ 1-3 times a month
☐ Never

How comfortable do you feel using parking meters?

[ ] [ ] [ ] [ ] [ ]
Very Comfortable Very Uncomfortable

Do you own a parking meter key?
☐ Yes
☐ No

When using a parking meter, how often do you pay using your parking meter key?
☐ Always
☐ Most of the time
☐ Sometimes
☐ Hardly ever
☐ Never

Do you own a cell phone?
☐ Yes
☐ No

How often do you carry your cell phone around with you?
☐ Always
☐ Most of the time
☐ Sometimes
☐ Hardly ever
☐ Never
What text-messaging capabilities does your cell phone currently have?
☐ Both Send & Receive
☐ Only Send
☐ Only Receive
☐ Neither

How many text messages do you send/receive in a week?
☐ 50 or more
☐ 30-49
☐ 10-29
☐ Less than 10
☐ None

How often do you use phone services that require you to interact with a pre-recorded message?
☐ More than 4 times a week
☐ 1-3 times a week
☐ 1-3 times a month
☐ Never

PARKING METER DESIGN
SURVEY II

TEXT MESSAGING SERVICE:

How convenient would the text messaging service be to you?
Very Convenient

How likely are you to refill your meter using this service?
Very Likely

How reliable is this service?
Very Reliable

How time consuming is this service?
Very Time-Consuming
PRE-RECORDED CALLING SERVICE:

How convenient would the pre-recorded calling service be to you?

Very Convenient  Very Inconvenient

How likely are you to refill your meter using this service?

Very Likely  Very Unlikely

How reliable is this service?

Very Reliable  Very Unreliable

How time consuming is this service?

Very Time-Consuming  Very Fast

OVERALL:

How challenging was using the parking meter?

Very Easy  Very Hard

How convenient would this parking meter be to you?

Very Convenient  Very Inconvenient

What interface (text-messaging or pre-recorded calling service) did you like more and why?

What suggestions would you make to improve the interface?
DESCRIPTION OF METRICS USED

We measured how long it took users to complete each task and how many errors they made while completing each task. We used time as a metric because we want the tasks to not be too time-consuming. We also used number of errors as a metric because we want the service to be intuitive to users and not allow for a lot of errors, especially since a single error would make the user have to do the tasks all over again and double the time taken to complete the task successfully.

Finally, we used satisfaction as a metric since time taken and errors made for tasks don't always make a complete picture. The phone interface requires more passive waiting than the text message interface, but quicker confirmation. Some users could prefer it or dislike it because of that. Also, some users could prefer one interface over another because they feel less nervous about using it. These kinds of things only come out by asking them to rate convenience, likelihood of using it, difficulty, and reliability.
SUMMARY OF RAW DATA COLLECTED

PARKING METER DESIGN
SURVEY I

Subject 1:
Age: 16-25
How often do you use parking meters? **Never**
How comfortable do you feel using parking meters? (1=Very Comfortable, 5=Very Uncomfortable)? **2**
Do you own a parking meter key? **No**
When using a parking meter, how often do you pay using your parking meter key? **Never**
Do you own a cell phone? **Yes**
How often do you carry your cell phone around with you? **Most of the time**
What text messaging capabilities does your cell phone currently have? **Both Send & Receive**
How many text messages do you send/receive in a week? **Less than 10**
How often do you use phone services that require you to interact with a pre-recorded message? **1-3 times a month.**

Subject 2:
Age: 16-25
How often do you use parking meters? **1-3 times a month**
How comfortable do you feel using parking meters? (1=Very Comfortable, 5=Very Uncomfortable)? **1**
Do you own a parking meter key? **No**
When using a parking meter, how often do you pay using your parking meter key? **Never**
Do you own a cell phone? **Yes**
How often do you carry your cell phone around with you? **Always**
What text messaging capabilities does your cell phone currently have? **Both Send & Receive**
How many text messages do you send/receive in a week? **30-49**
How often do you use phone services that require you to interact with a pre-recorded message? **1-3 times a month.**

Subject 3:
Age: 16-25
How often do you use parking meters? **1-3 times a month**
How comfortable do you feel using parking meters? (1=Very Comfortable, 5=Very Uncomfortable)? **2**
Do you own a parking meter key? **No**
When using a parking meter, how often do you pay using your parking meter key? **Never**
Do you own a cell phone? **Yes**
How often do you carry your cell phone around with you? **Always**
What text messaging capabilities does your cell phone currently have? **Both Send & Receive**
How many text messages do you send/receive in a week? **50 or more**
How often do you use phone services that require you to interact with a pre-recorded message?
1-3 times a month.

PERFORMING TASKS

Subject 1:
Text-Messaging Service:
   Task 1: time - 182s, errors - 2
   Task 2: time - 55s, errors - 0
Pre-Recorded Calling Service
   Task 1: time - 46s, errors - 0
   Task 2: time - 80s, errors - 1
   Task 3: time - 87s, errors - 0

Subject 2:
Text-Messaging Service:
   Task 1: time - 25s, errors - 0
   Task 2: time - 23s, errors - 0
Pre-Recorded Calling Service
   Task 1: time - 45s, errors - 0
   Task 2: time - 63s, errors - 0
   Task 3: time - 80s, errors - 0

Subject 3:
Text-Messaging Service:
   Task 1: time - 47s, errors - 0
   Task 2: time - 51s, errors - 0
Pre-Recorded Calling Service
   Task 1: time - 49s, errors - 0
   Task 2: time - 72s, errors - 0
   Task 3: time - 80s, errors - 0

PARKING METER DESIGN

SURVEY II

Subject 1:
Text Messaging Service
   How convenient would the text-messaging service be to you (1=Very Convenient, 5=Very Inconvenient)? 3
   How likely are you to refill your meter using this service (1=Very Likely, 5=Very Unlikely)? 4
   How reliable is this service (1=Very Reliable, 5=Very Unreliable)? 3
   How time consuming is this service (1=Very Time Consuming, 5=Very Fast)? 2

Pre-Recorded Calling Service
   How convenient would the text-messaging service be to you (1=Very Convenient, 5=Very
Inconvenient)? 2
How likely are you to refill your meter using this service (1=Very Likely, 5=Very Unlikely)? 2
How reliable is this service (1=Very Reliable, 5=Very Unreliable)? 2
How time consuming is this service (1=Very Time Consuming, 5=Very Fast)? 1

Overall
How challenging was using the parking meter (1=Very Easy, 5=Very Hard)? 3
How convenient would this parking meter be to you (1=Very Convenient, 5=Very Inconvenient)? 2
What interface (text messaging or pre-recorded calling service) did you like more and why? Calling service; it was more clear how to use it. Text messaging felt easy to make a mistake.
What suggestions would you make to improve the interface? Explain how to separate key #, meter #, and minutes to add.

Subject 2:

Text Messaging Service
How convenient would the text-messaging service be to you (1=Very Convenient, 5=Very Inconvenient)? 1
How likely are you to refill your meter using this service (1=Very Likely, 5=Very Unlikely)? 3
How reliable is this service (1=Very Reliable, 5=Very Unreliable)? 1
How time consuming is this service (1=Very Time Consuming, 5=Very Fast)? 5

Pre-Recorded Calling Service
How convenient would the text-messaging service be to you (1=Very Convenient, 5=Very Inconvenient)? 3
How likely are you to refill your meter using this service (1=Very Likely, 5=Very Unlikely)? 4
How reliable is this service (1=Very Reliable, 5=Very Unreliable)? 1
How time consuming is this service (1=Very Time Consuming, 5=Very Fast)? 3

Overall
How challenging was using the parking meter (1=Very Easy, 5=Very Hard)? 1
How convenient would this parking meter be to you (1=Very Convenient, 5=Very Inconvenient)? 3
What interface (text messaging or pre-recorded calling service) did you like more and why? Text messaging if you’re a regular user because it’s faster.
What suggestions would you make to improve the interface? Instructions for text message are in plain English but still worried about doing it right because you’re sending too many things at once. Would be annoying to use up 3 texts to refill it if you inputted wrong information.

Subject 3:

Text Messaging Service
How convenient would the text-messaging service be to you (1=Very Convenient, 5=Very Inconvenient)? 2
How likely are you to refill your meter using this service (1=Very Likely, 5=Very Unlikely)? 4
How reliable is this service (1=Very Reliable, 5=Very Unreliable)? 4
How time consuming is this service (1=Very Time Consuming, 5=Very Fast)? 4
Pre-Recorded Calling Service

How convenient would the text-messaging service be to you (1=Very Convenient, 5=Very Inconvenient)? 2
How likely are you to refill your meter using this service (1=Very Likely, 5=Very Unlikely)? 3
How reliable is this service (1=Very Reliable, 5=Very Unreliable)? 2
How time consuming is this service (1=Very Time Consuming, 5=Very Fast)? 3

Overall

How challenging was using the parking meter (1=Very Easy, 5=Very Hard)? 1
How convenient would this parking meter be to you (1=Very Convenient, 5=Very Inconvenient)? 2
What interface (text messaging or pre-recorded calling service) did you like more and why? Text messaging, faster.
What suggestions would you make to improve the interface? Make texts more reliable.
VISUAL SUMMARIES OF DATA

PERFORMING TASKS

Task #1: Activate text messaging reminder
Task #2: Add 80 minutes to parking meter (using text messaging)
Task #3: Activate calling reminder
Task #4: Check your key balance (using pre-recorded calling service)
Task #5: Add 80 minutes to your meter (using pre-recorded calling service)
Text Messaging vs. Calling Service

Overall Parking Meter
INTERPRETATION OF RESULTS

There are several problems with each interface. For example, the text messaging system is more unreliable. We have a way to confirm input, but it's slower than a typical way of confirming input because the user has to wait for a text message confirmation. It is also not universally accessible since not all people have cell phones that have text messaging capabilities. The phone system is more accessible and gives quicker feedback but the process as a whole is slower because the user has to listen to instructions, go through entire menus, and input each piece of information one at a time. As long as a person is good at texting, the time they spend texting is small.

RECOMMENDATIONS ON HOW TO IMPROVE THE INTERFACE

Text Messaging

One improvement we should have for the text messaging system is to include parking meter information on the text that is sent out when text-messaging is requested. Before, the text message the user received would look something like:

Your meter will expire in 2 minutes

Instead, we should have something more informative like this:

Meter 666 will expire in 2 min. To refill, text the meter #, key #, and # of quarters to 217-123-4567 (example: 666 123456 4)

This would make refilling much easier because users would not have to remember instructions they read a while ago on the parking meter.

Similarly, there should be example text messages given on the parking meter so that users are more sure of the texts that they send.

Pre-Recorded Calling Service

The main drawback of the phone interface is that it is time-consuming. There is not much that can be done since trying to make the messages more concise would result in less clarity, which could end up being more time-consuming.

One thing we could try is tying each parking meter to the parking key that it was filled with (if it was filled by parking key). When someone refills their meter by phone, all they would need to input is their meter number and how many quarters they want to add to it. The phone service would then fill that meter using the parking key number associated with it or give the user an error. Any time a car leaves a parking space, the parking key number for that space is cleared.