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NMIX



Cook and track your food with ease.

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## The Team



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## Project Outline

Our dear professor, Dr. Shamp, inspired our product. Dr. Shamp came to talk to our team one day about his constant worry of his mother's well being. He mentioned that he had taught her how to use the microwave multiple times and finds himself having to explain it over the phone time and time again. Sometimes he even worries if his mother has had anything to eat at all. This is where we come in. We want to eliminate this constant worry that Dr. Shamp has, but not only that, we want to improve his mother's interaction with the kitchen. We want to improve YOUR interaction with the kitchen.

Not only this, but we want to improve the lives of everyone involved. The Nukelt+ app will be able to automate your kitchen appliances to an extent, send notifications as items are cooked and completed. Our app will also have the ability to actively track the food a user has been eating and also spot trends in eating habits and suggest new foods by offering free digital coupons.

Welcome to the Nukelt+ technical walkthrough. Looking at the project it seems rather straightforward, but the little known facts about the project is the daunting electronics involved with the operation of such a device. There are three major components to the system a microwave, a programmable micro-controller, and an iOS device. There are many other sub-components to the system as well that help getting the task of cooking your food completed. Over the next few pages we will be explaining how this individual systems work together.

## Project Outline

It all starts with the microwave, the basis for the design. Any average microwave with some modification can be converted for this project. We simply added a solid-state relay in order to remotely trigger the microwaving circuit and bypass the control pad on the front. The relay itself gets its trigger voltage ~5V from a programmable micro controller. When the 5V trigger is supplied to the relay it closes the 110V switch necessary to activate the microwave.

The micro controller that is providing the trigger voltage to the relay is programmed to run a timer, which in turn supplies electricity to the relay for the duration of the timer. The timer has a single input variable. When not in use it is waiting to receive an infrared pulse. Every infrared pulse constitutes 30 seconds of microwave runtime (e.g. 1 pulse = 30 seconds, 2 pulses = 60 seconds, 3 pulses = 90 seconds, 4 pulses = 120 seconds)

The final major component is an iOS device. Since we have learned to program on these it was only natural to use it as our mobile device backbone. In order to send an infrared pulse we had to build an infrared transmitter of which the components came from an old Charter cable box remote and headphones cable. We then used Red Foundry (an iOS developers platform) to play an audio sound that triggers the infrared sensor that is plugged into the headphones jack of the iOS device.

Despite our modifications the microwave is still able to retain it's factory functionality. Our system is designed to be supplementary to a normally functioning microwave and will not hinder its performance in any way. So if a user ever deems it necessary to override the smartphone capability they just treat the microwave like a normal generic unit.

## Project Outline

That in a nutshell is how the communication between the mobile device and the microwave occur! So once we have this communication mechanism in place we can begin to explain the other involved components.

So why did we elect to do it this way? Why not integrate the scanner into the microwave for instance. One of the main reasons we decided to take the route of using a mobile device is that a lot of them are already in active service. It is hard to go through life without seeing one of these commonplace items. Another is that the mobile device offers a cheap developing platform and a versatile architecture open to the tinkering mind. In addition, with the ability to scan food with your smartphone it can process the data and provide the user with metrics. The concept can also lead to the development of a potential future all-in-one device that optionally links up with your phone.

This technology should make cooking in the kitchen not only easier, but also safer. You will no longer have to strain your eyes reading instructions, but rather have perfect cook times chosen every single time.

Visit our site for more information!



### Microwave Program I/O goodness

Current Status of Microwave (Activated, or not)

Can output what is on microwave LCD (i.e current time, or time remaining in cooking)

Notification when completed (how will this be known, what does microwave do different when it finishes a job?)

If door isn't opened after food has been cooked continue to send reminders. (Have a switch in the door to sense if door is opened after)

Figure out controller board on microwave, what buttons send what kind of signals to where?

Once this is figured out how do I utilize known signals in a program?

### Program Components:

Splash Screen when loading

Welcome screen: *1) view stats of food 2) Scan Barcode 3)Settings*

1) stat screen shows

- all the food you have consumed and all the details
- gives breakdowns on what you had on what day/time
- Allows you to compare with family and friends
- Gives suggestions as to what you should eat

2) Barcode Scanning Page

- Activates Device Camera
- Item is scanned and nutritional information is scanned in and displayed
- Button pop up on bottom [Cook]



### Program Components cont.:

Maybe provide feedback of what is on LCD or start it's own rough timer while food is cooking

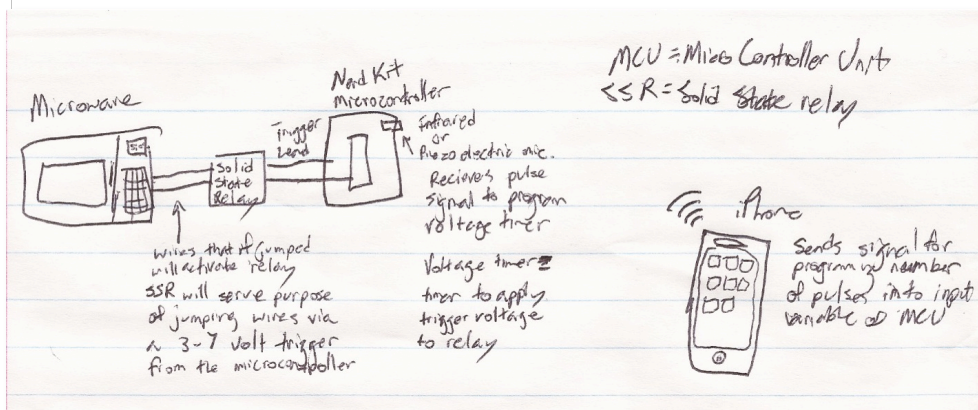
### 3) App Settings

- Set which microwave you are going to communicate with
- Allows for testing of communication between mobile unit and microwave
- Dev Settings?

### Methods of Controlling:

1) Build with custom components, own controller board (arduino), and customer wireless controller(WRT54G). Much like the WiFi robot. Figure out programming and interfacing. More options cleaner look = MORE DIFFICULT

2) Use a Lego mind storms kit. There are interfaces with this and seem to be more resources that are within grasp for this particular build. Seems easier, but it requires two iOS devices. Lego light sensor has the ability to tell the difference between light and dark and it can determine light intensity as well. Can multiple sensors be used in order to send different combinations of commands?



### Initial Programming:

- Upon launch of program it must recognize state of device (microwave) on or off, followed by that it needs to display it's interface.
- Scan it, should be an option.
- Upon scan of an item, the system will do an internet query on the items barcode and spit back the nutritional information as well as the cooking information.
- The cooking information needs to be relayed to the microwave.
- Some how the control pad on the microwave needs the "cook time" button pressed followed by a pause then the number sequence for the particular food item.

OR

- The +30 second button can be pushed and are over estimated.
- The interface on the phone then shows cook and the program halts until a command is given.
- If cook is pressed microwave gets start command and starts cooking food.
- It would be nice to get a counter on the IOS device as well whether it is being outputted from the microwave LCD or a rough counter initiated on the iOS device.
- Once the countdown is complete a reminder will be sent to the phone to user and whoever the user has selected to receive notifications as well.
- Now unless the light in the microwave has been triggered (should be simple "if" command (if voltage detected cancel repeat notifications)) microwave will quit sending notifications to phone.
- Once the door is opened the nutritional info is stored to your phone and synced to an online account. Much like Nike +



### **Additional Sources:**

#### **iPhone Controlled Robots/Vehicles:**

<http://ismashphone.com/2010/10/15-awesome-iphone-controlled-robots.html>

#### **Koreans Virtual Super Market:**

<http://www.digitaltrends.com/mobile/south-korean-supermarket-chain-opens-virtual-grocery-stores-in-subways/>

#### **iPad Controlled Home Appliances:**

<http://www.engadget.com/2011/08/31/siemens-shows-off-ipad-controlled-homeconnect-appliances/>

#### **WiFi Robot:**

<http://www.jbprojects.net/projects/wifirobot/>

#### **Programmable Controller Board: Arduino**

[http://store.fundamentallogic.com/ecom/index.php?main\\_page=product\\_info&cPath=3&products\\_id=2&zenid=834b55da732f871f9a5e721cd6cc89d4](http://store.fundamentallogic.com/ecom/index.php?main_page=product_info&cPath=3&products_id=2&zenid=834b55da732f871f9a5e721cd6cc89d4)

#### **How to hack a WRT54G Router:**

<http://books.google.com/books?id=GBtJdvMeAJQC&pg=PA27&dq=wrt54gl&sig=ACfU3U1hMZe5rdlYKICQrJFD-GNo26SF7w#v=onepage&q=wrt54gl&f=false>

#### **Voice Activated Microwave:**

<http://www.youtube.com/watch?v=gkjFZ-FGjfU>

#### **How-to for serial communication with the PIC16F628:**

<http://www.oz1bxm.dk/PIC/628uart.htm>

## Mobile App

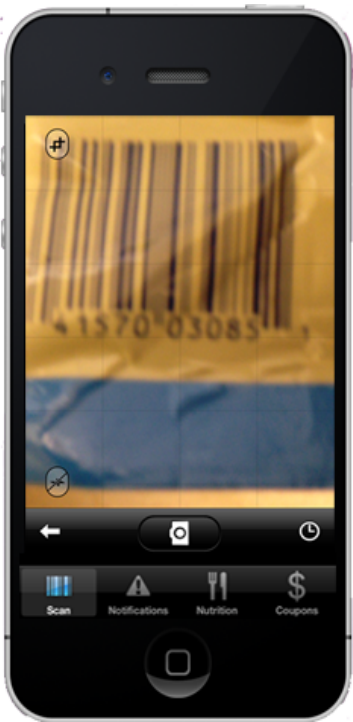


Our app has four navigation panes located at the bottom of the screen. With it users are able to scan, set up family or friends to be notified, investigate nutritional possibilities, and review digital coupons.



When a user wants to cook an item of food, they would click on the start scanner function, and a barcode scanner will launch allowing them to scan the item of food which in turn would provide them with the nutritional information for the food and would also output the cook time to the microwave.

## Mobile App



The device camera is activated to allow the use of the barcode scanner. The food item barcode is then scanned and displayed.



After the scanning is complete, the nutritional information for the food item is then viewable by the user.

## Mobile App

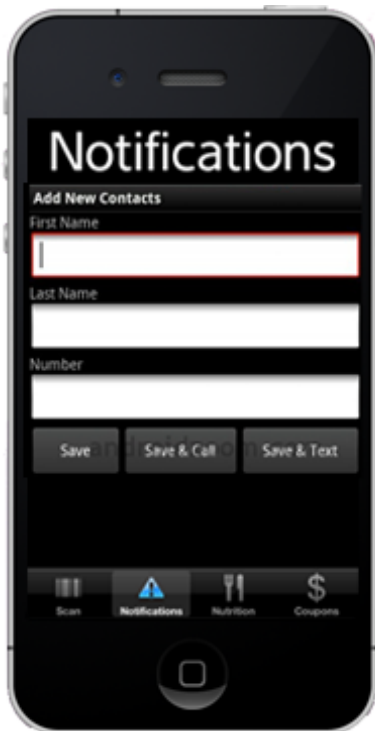


After the user reviews the nutritional facts of the food item, they can activate the [cook it!] option and the app will output the cook time to the microwave. Upon closing of the microwave door, the counter will display on the mobile device screen to allow the user to know how much time until completion.

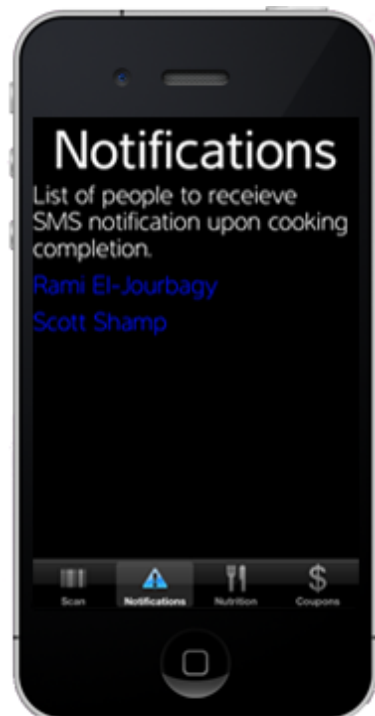


A counter would display on the screen and upon completion would send notifications (email, SMS, MMS) out to the individuals listed in the notifications tab.

## Mobile App



The app allows the user to input important contacts within the notification page. Notifications of completion of the food will be sent either via email, SMS, or MMS out to the individuals listed in the notifications tab. This feature allows family members to have a constant watch over loved ones who may suffer from short-term memory or memory loss.



Activating the 'Notifications' pane will allow the user to see the list of people, who they can select from, to notify of each microwave use completion.

## Mobile App



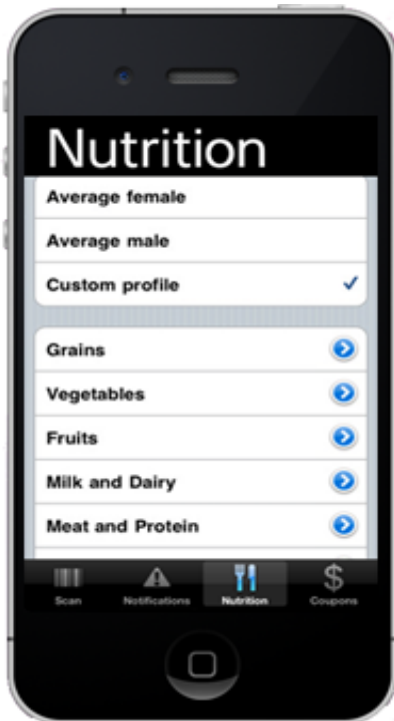
Example of notification confirmation



Example of notification confirmation



## Mobile App



Upon closing of the microwave door, the nutritional facts of the scanned food item will be stored permanently in the app. The user can access their nutritional history at any time. Not only are users able to keep track of personal consumption, they can also share this information with family and doctors.



An additional feature that our app offers is a graphic view of the users nutritional consumption. Users can view their nutritional facts by day, month, or year.

## Mobile App



Another great feature of the app is that it learns the preferred foods of the user and catalogs appropriate digital coupons. Ideally, the coupons can be used online or in store.

