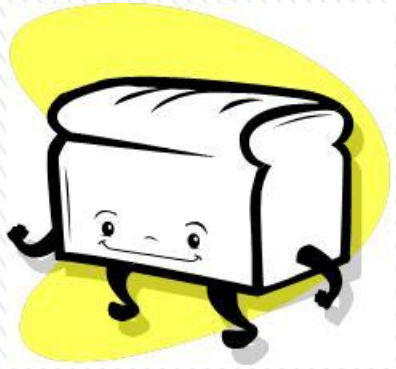
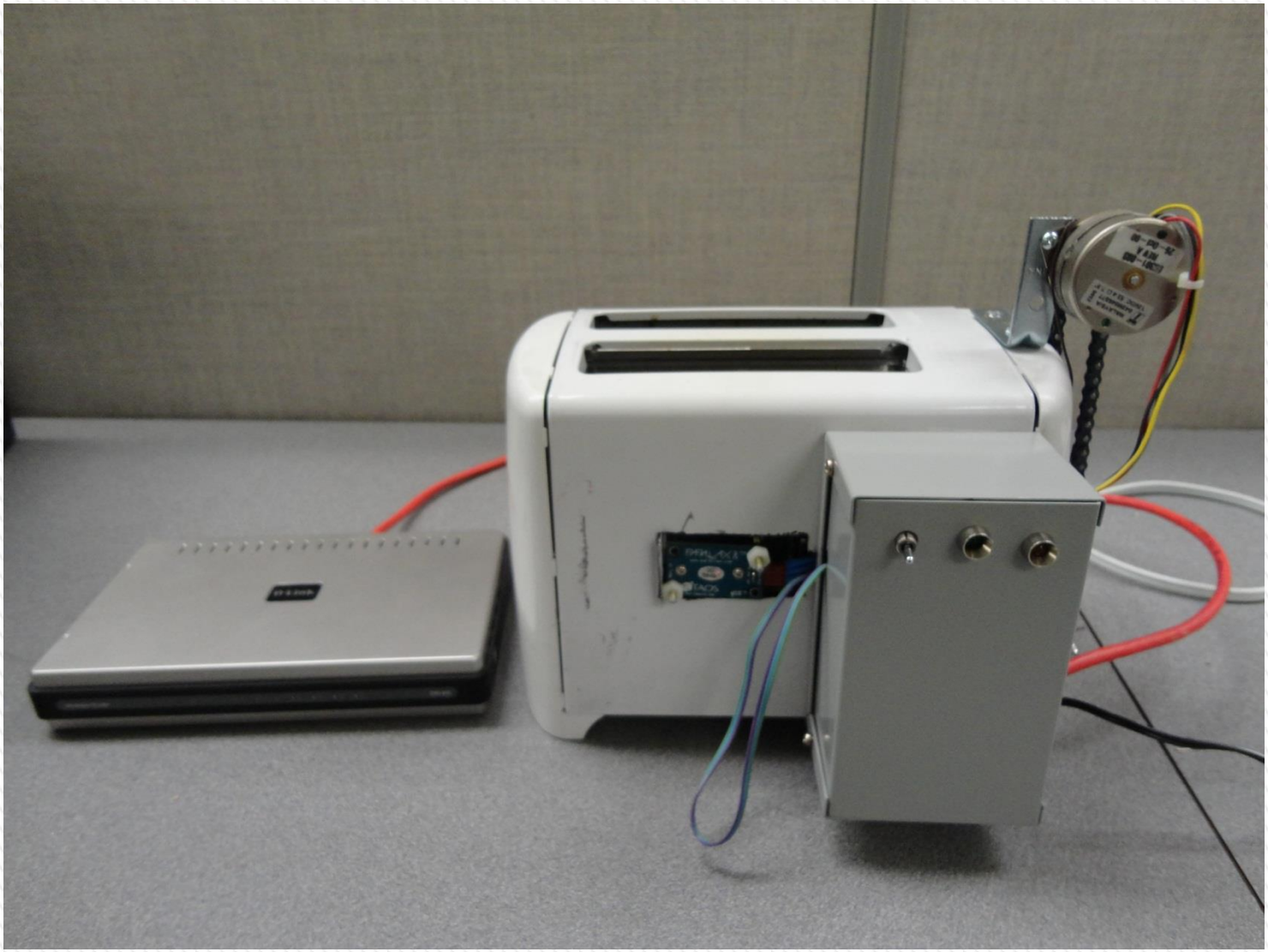
ELEX 4330

Smart-Toaster

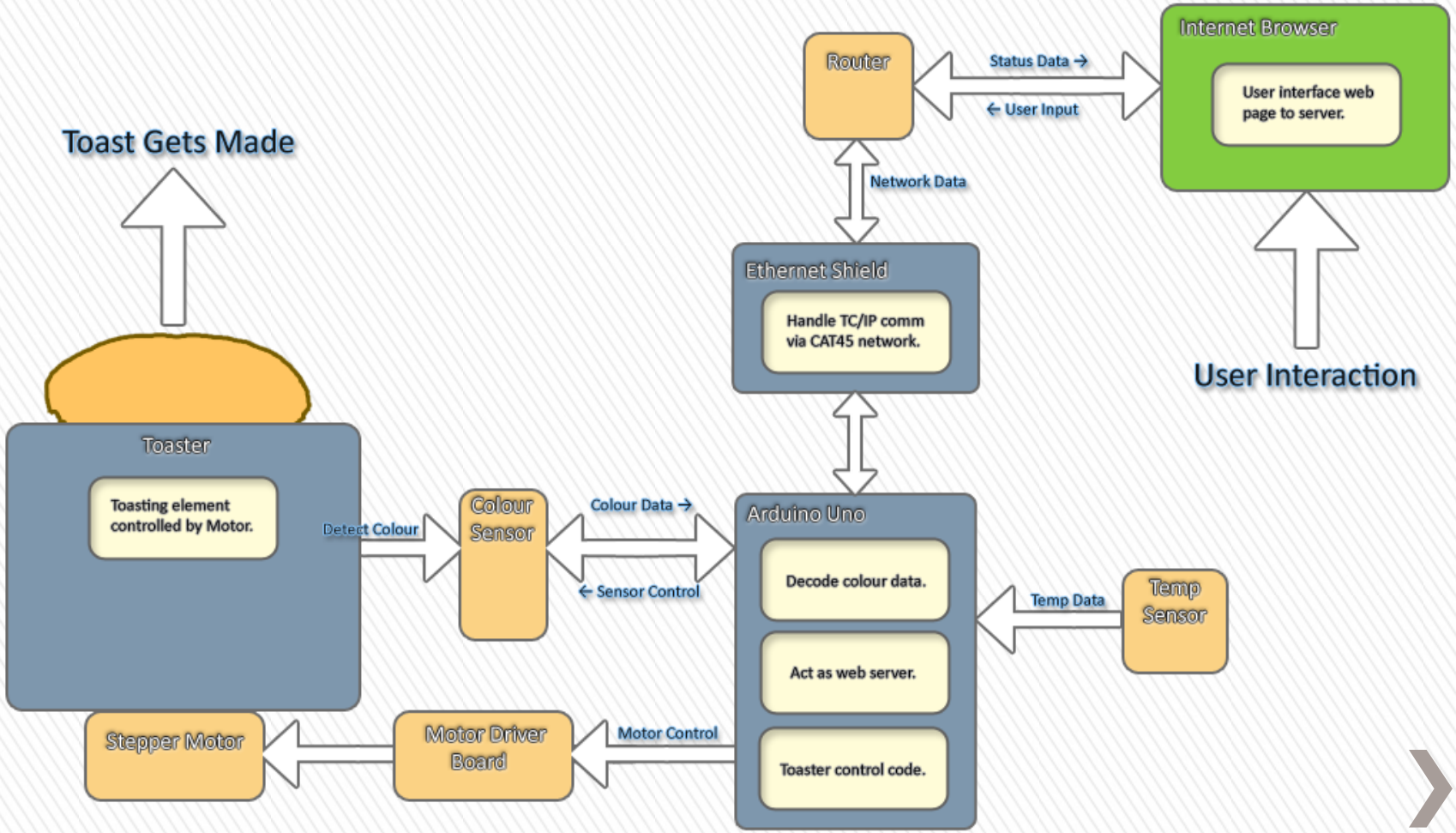
Project Presentation

Presented by:
Jin Won Seo
William McLachlan
Raymond Chan





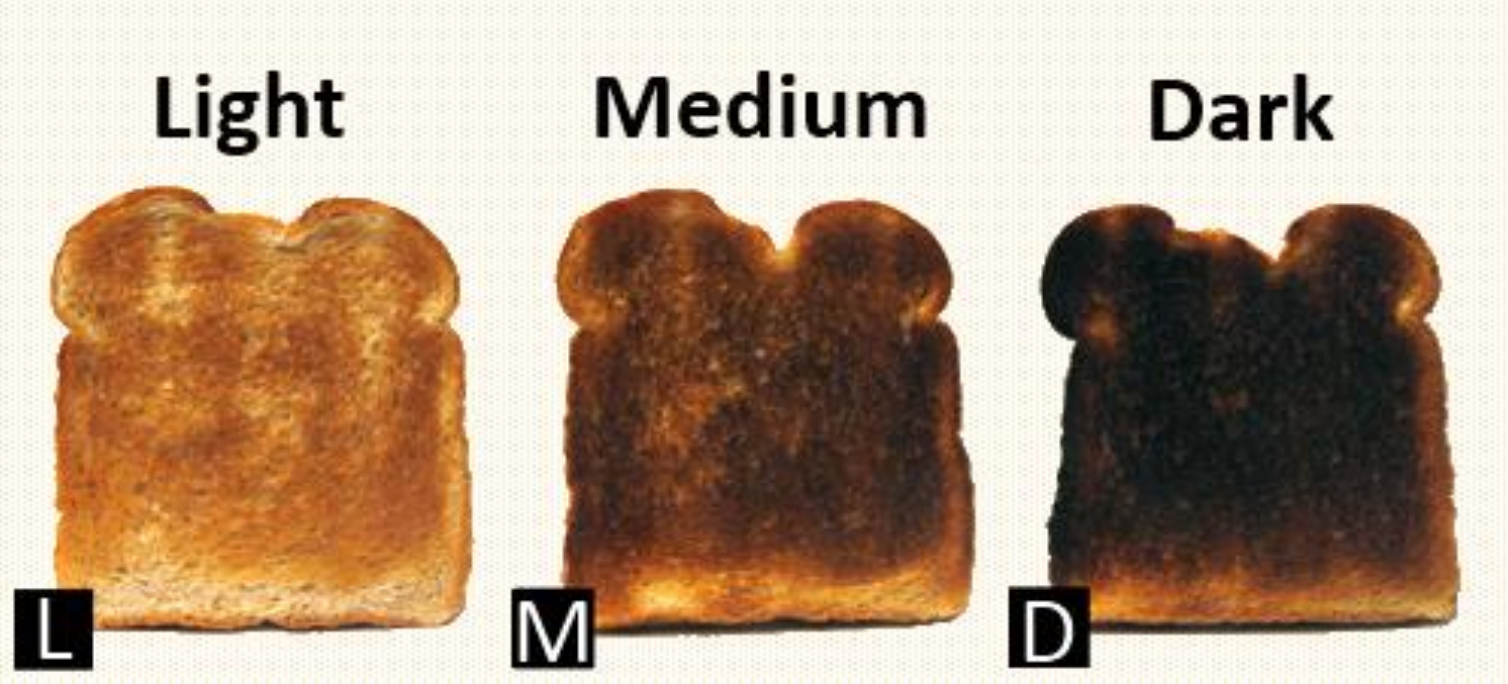
System Overview



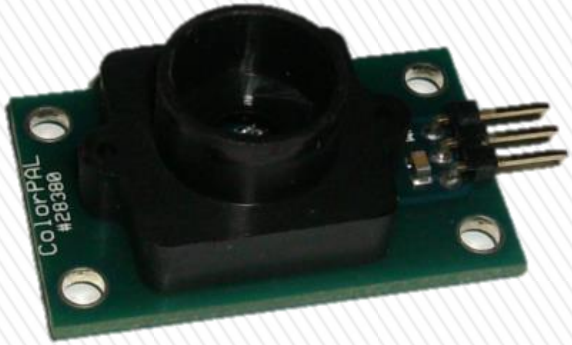
Components Overview

- Toast Testing
  - Colour Sensing
- Toaster Control
  - Stepper Function
- Web Interface
  - Server & Pages
- Timing Code
  - Counting Down

Levels of Toasting



Colour Sensor



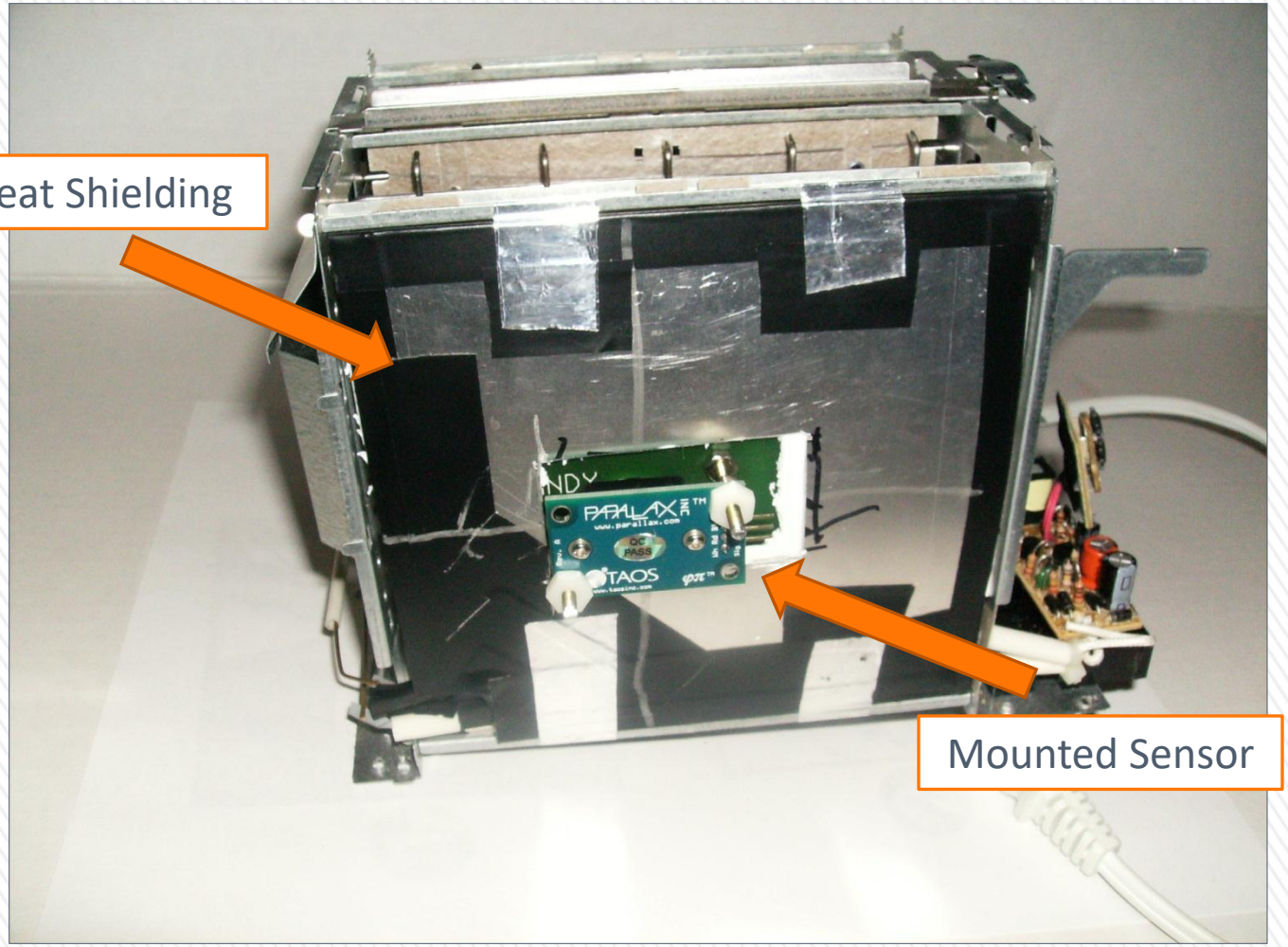
ColorPAL Colour Sensor

RGB Colour Data

Level Ranges

	Red Low	Red High	Green Low	Green High	Blue Low	Blue High
Level						
Light	0x40	0x42	0x30	0x36	0x48	0x51
Medium	0x42	0x47	0x30	0x36	0x46	0x54
Dark	0x34	0x39	0x30	0x37	0x46	0x50

Mounting



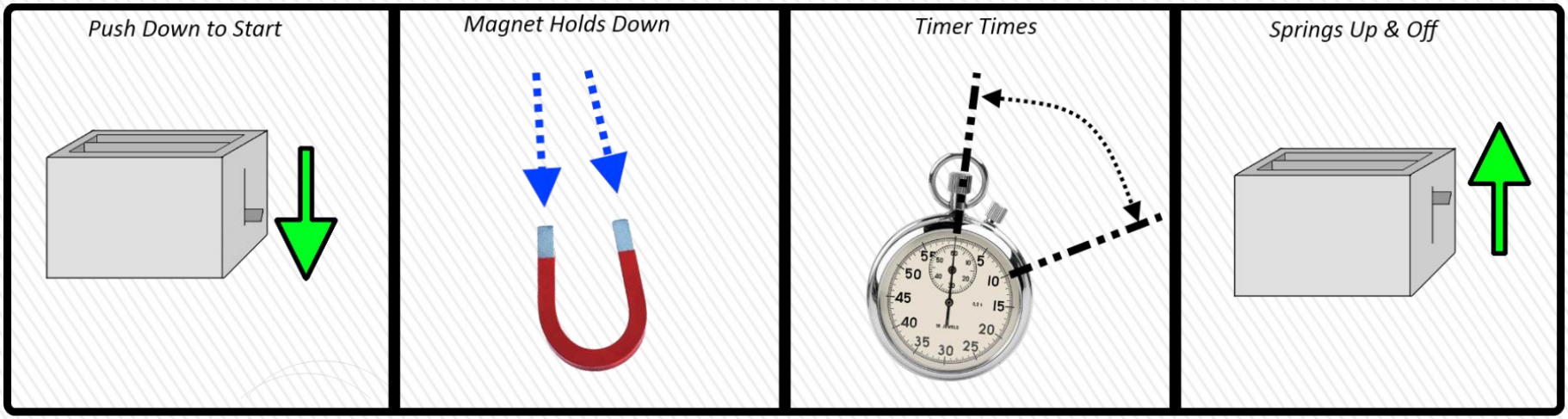
Problems

- Toaster gets too hot
- Colour ranges overlap

Recommendations

- Use better insulating materials
  - Real glass for color sensor viewing window
- Move sensor closer to toast
  - Sensor reads better when closer

Toaster Operation

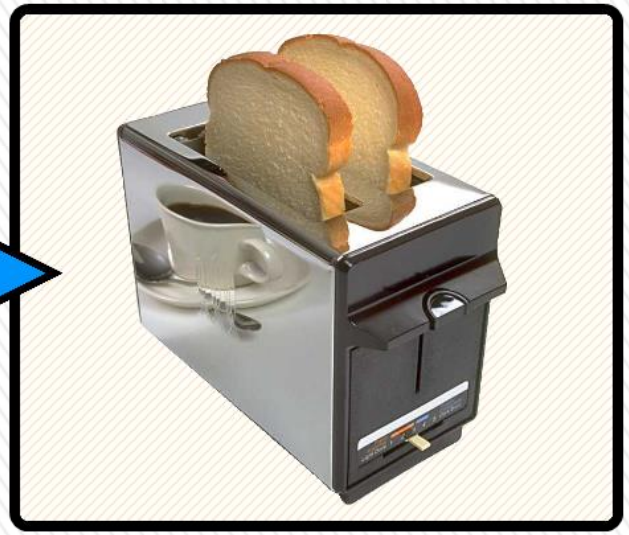


Why the change?

User

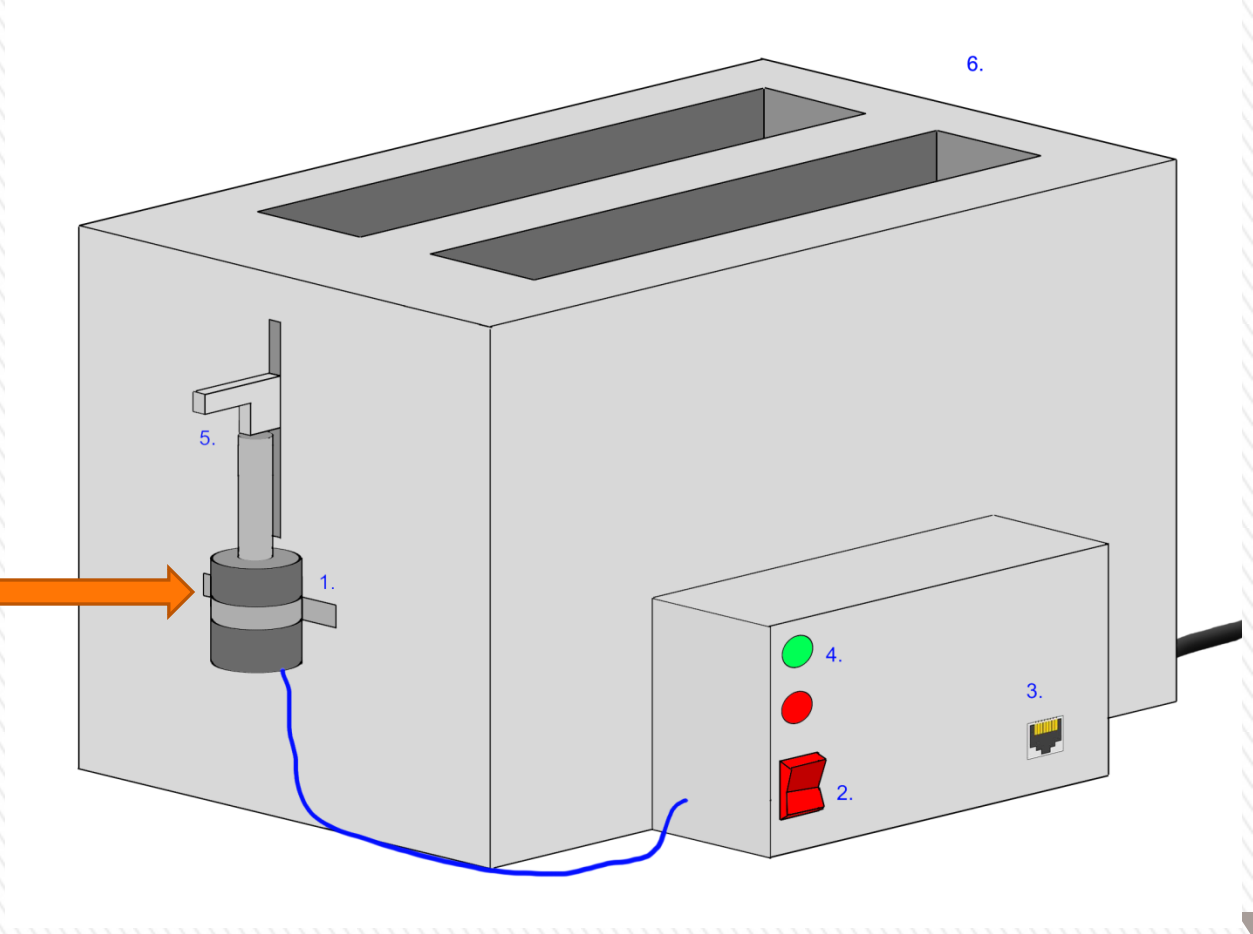
Remote

Distance

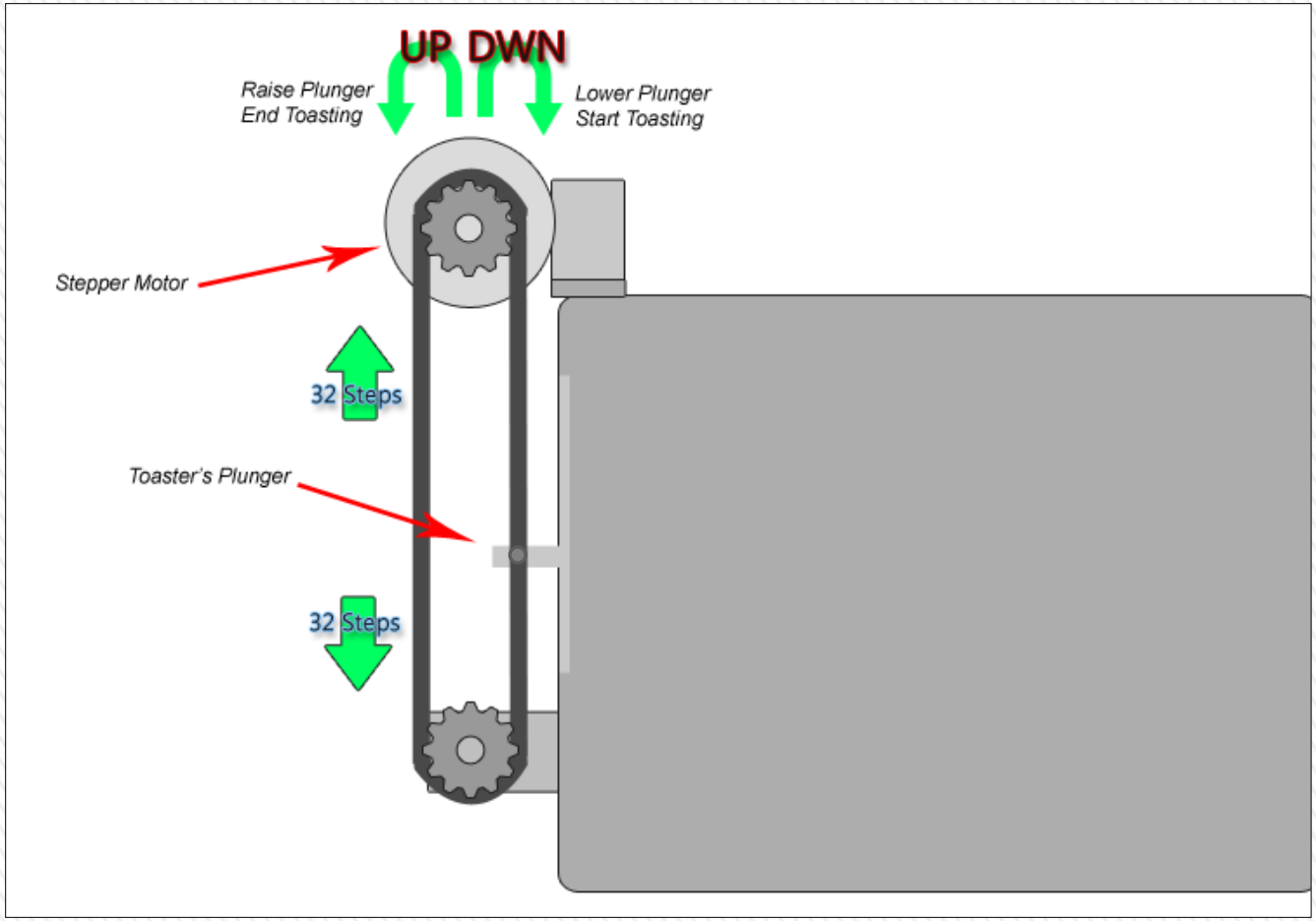


Toaster

Original Design



New Design


UP DWN
Raise Plunger
End Toasting
Lower Plunger
Start Toasting
Stepper Motor
32 Steps
Toaster's Plunger
32 Steps

Problems

- Unit does not know where the plunger is
  - Assumes Plunger is UP and OFF at start
  - Does not know if toaster is really on or not

Recommendations

- Add limit switches
  - To detect reaching either end
- Add sensor to check if ON

Smart-Toaster Web Server

Jin Won Seo

Hardware Configurations

- **The Arduino Ethernet Shield**
  - Allows an Arduino board to connect to the internet.
  - Wiznet W5100 Ethernet chip(Connection speed: 10/100Mb).
  - Provides a network (IP) stack capable of both TCP and UDP.
- **Router.**
- **Arduino Uno**(micro controller).

Arduino Ethernet Shield

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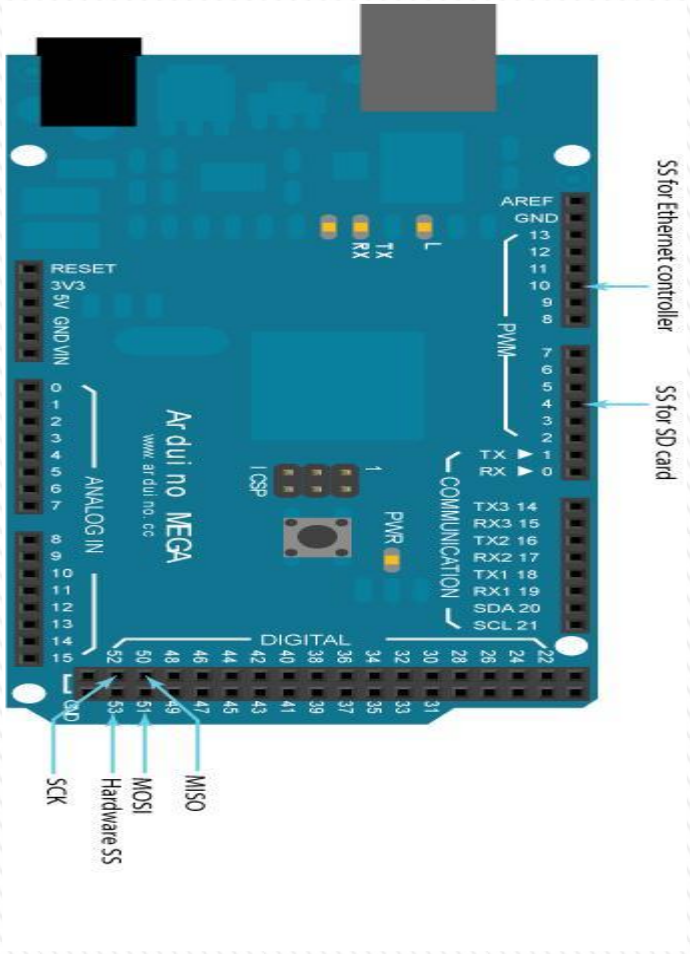
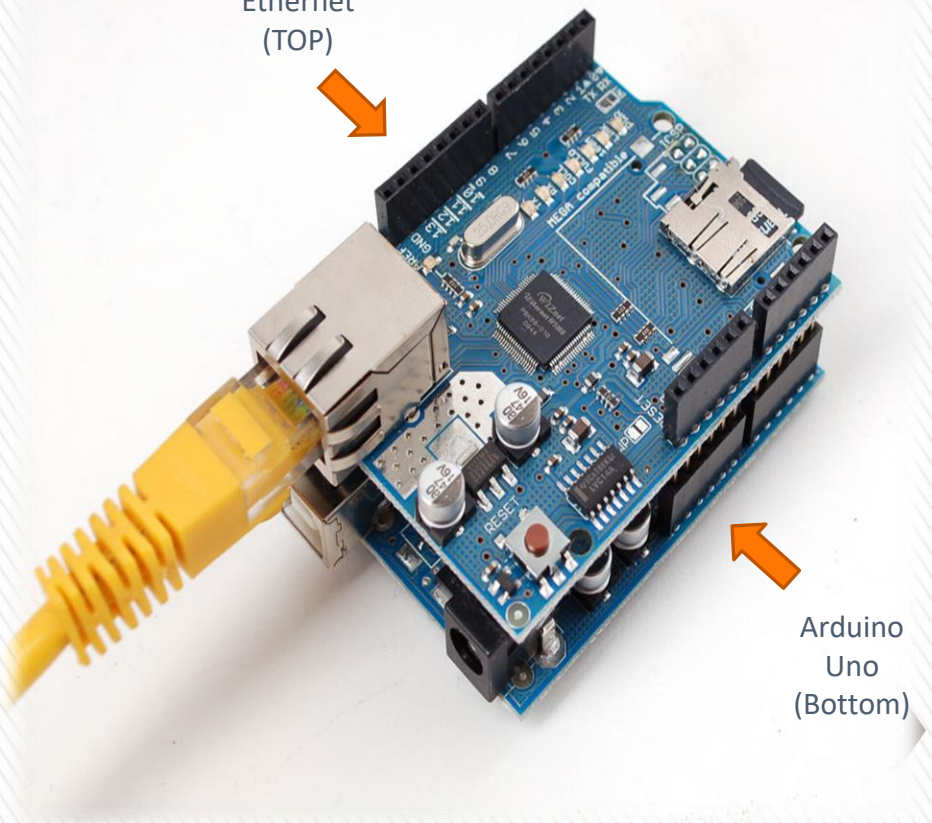


Arduino Ethernet (TOP)



Arduino Uno (Bottom)

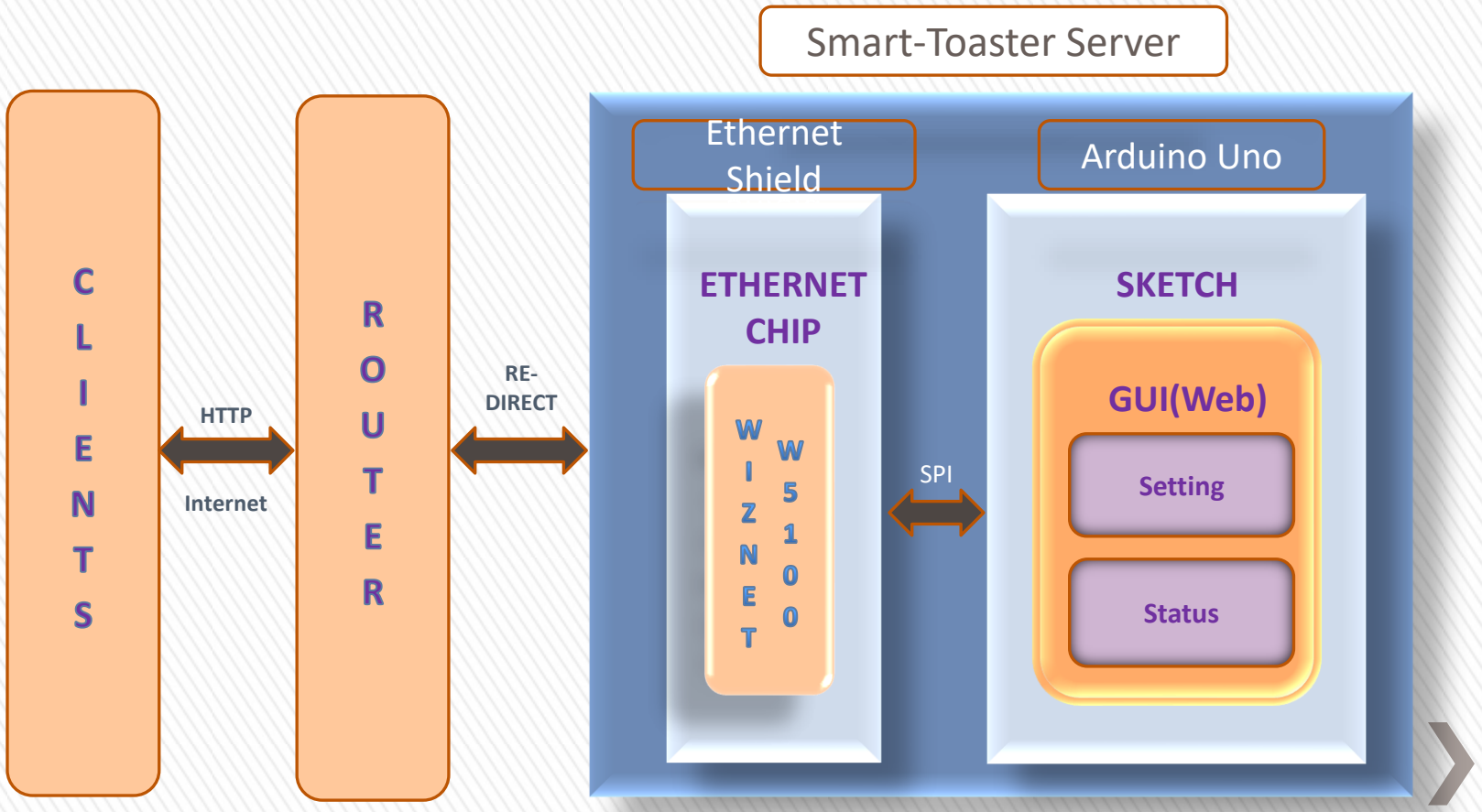
Protocol(HTTP)

- **Hypertext Transfer Protocol**
  - TCP/IP based communication protocol.
- **Initial Line**
  - Request : e.g. GET /path/to/file/index.html HTTP/1.0
  - Response : e.g. HTTP/1.0 200 OK
- **Header**
  - Header lines contains information about the request or response
  - e.g. User-agent: Mozilla/3.0Gold

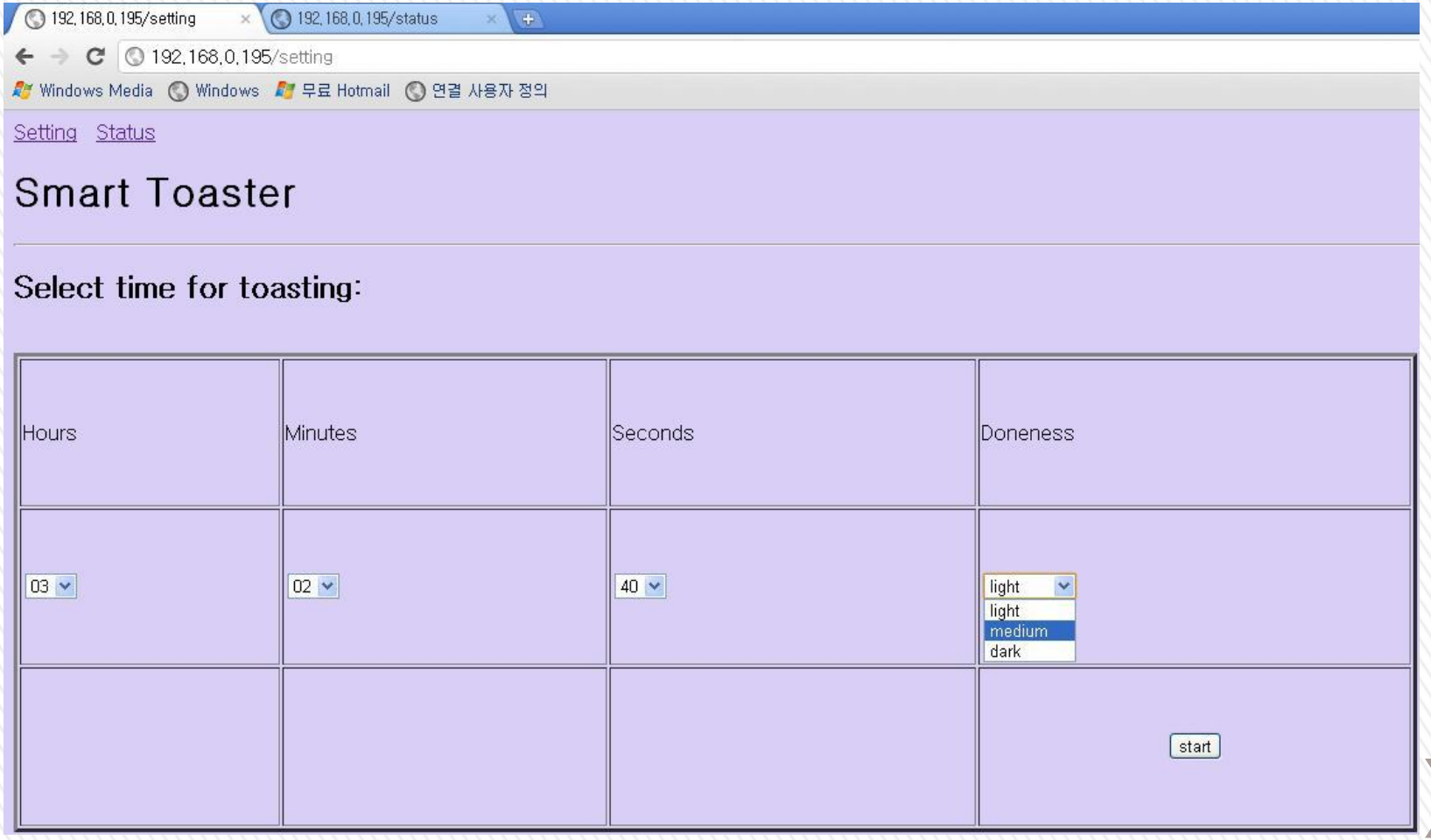
Protocol(HTTP)

- **Body**
  - Followed by the header.
  - e.g. Content-Type : text/html or image/gif.
  - e.g. Content-Length: the number of bytes in the body.

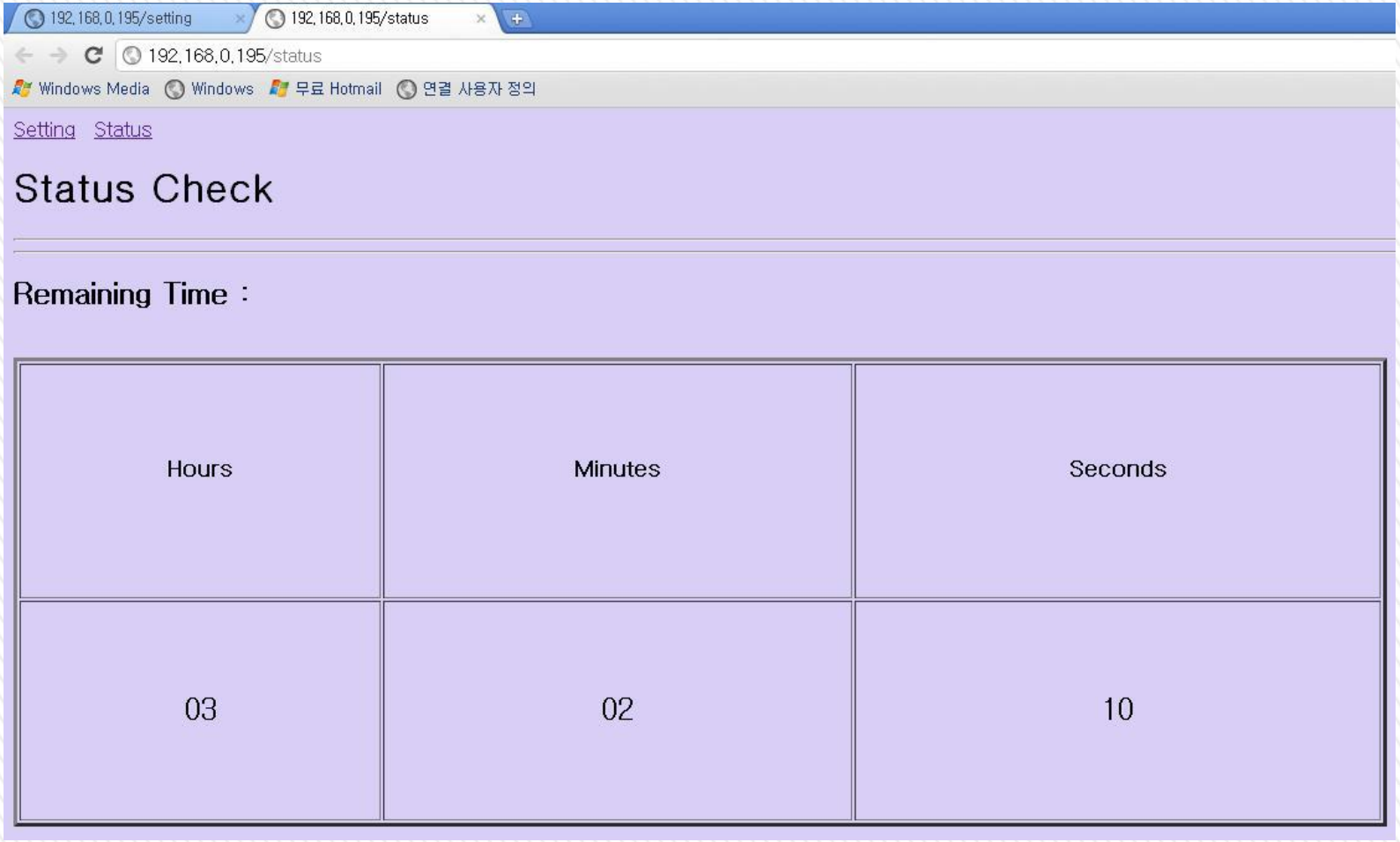
Network Block Diagram



GUI(Setting)


192.168.0.195/setting
192.168.0.195/status
192.168.0.195/setting
Windows Media
Windows
무료 Hotmail
연결 사용자 정의
Setting
Status
Smart Toaster
Select time for toasting:
Hours
Minutes
Seconds
Doneness
03
02
40
light
light
medium
dark
start

GUI(Status)


192.168.0.195/setting
192.168.0.195/status
192.168.0.195/status
Windows Media
Windows
무료 Hotmail
연결 사용자 정의
Setting
Status
Status Check
Remaining Time :
Hours
Minutes
Seconds
03
02
10

Problems

- **Lack of resources.**
  - Libraries.
  - Memory(SDRAM : 2KB) : Can’t use various HTML effects.
- **Poor Debugger** (no break point).
  - Hard to debug.
- **No Connection pool.**
  - Server shuts down and pending easily.

Better Solutions

- **Model-View-Controller (MVC).**
  - Break down applications into Model, View, Controller.
- **Distribution system.**
  - Place views(HTMLs) and controllers to the Web Server (e.g. Apache).
  - Client <-> Web Server <-> Arduino Ethernet <-> Arduino Uno
- **Use Flash memory (32KB) or SD card.**
  - Efficient for multi-web pages.
  - But need contents management programming.

The Timer and Stepper Motor Functions

Raymond Chan

ARDUINO

- The reference on internet
  - the driver and header library on the official page
- No installation and easy to use
  - Small Java file for compile
- Handy size of the board
  - Connect board to the USB port

Timer

- Timer Interrupt
  - Activate the toaster
  - Interrupt routine keeps the clock running
  - ADC detect the temperature

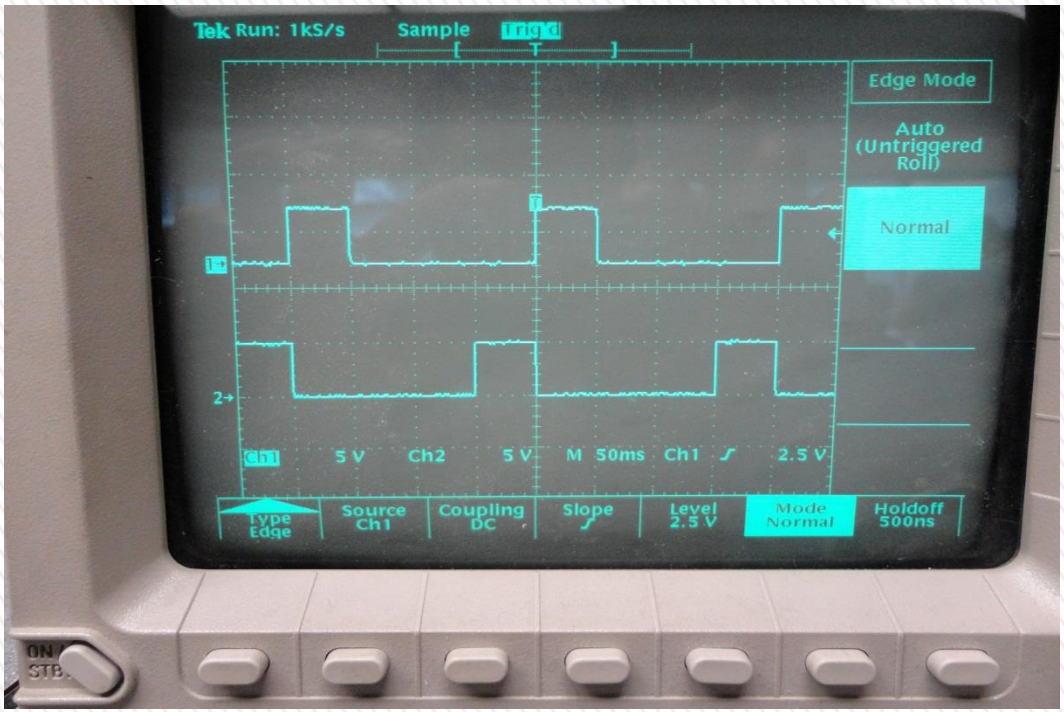
Timer

- STRINGSETUPALARM
- get the string from WEBPAGE

- CHECKDONE()
- Used while(CHECKDONE())

Stepper Motor

- STEPMOT
- generates pulse to the motor IC
- whether PUSH DOWN or PULL UP the slot
-



Improvement

- Use the internet connection to update or get the current time.

Conclusion

- **What we have done is…**
  - The Smart-toaster Web Server
  - Timer
  - Mechanical Operation
    - Stepper Motor
    - Plunger
  - Color Sensor

Recommendations

- Use better insulating materials
- Move sensor closer to toast
- Add limit switches.
- Add sensor to check if ON.
- Model-View-Controller (MVC).
- Distribution system.
- Use Flash memory or SD card.
- Update real time from the internet.

- Demonstration
- Q&A