Internet of Things (IoT) Information Display

Benjamin Daszkiewicz & Jacob Nading

Advised by Dr. Aleksander Malinowski

Contents

Introduction

- Modern technology-driven world
- Use of technology for constant improvement
- Busy people, volatile schedules
  - Need the ability to communicate updating schedules
  - Share information with coworkers or students
  - Seamless synchronization between systems

The IoT Information Display

Problem Statement

- Idea for project by Dr. Malinowski
- Increase ease of communication between students and professors
  - Busy schedules
  - Encourage use of office hours
  - Clumsy web alternatives
  - Difficulty in making multiple schedules apparent to others
  - Abrupt change in schedule causes multilayered problem of informing those affected

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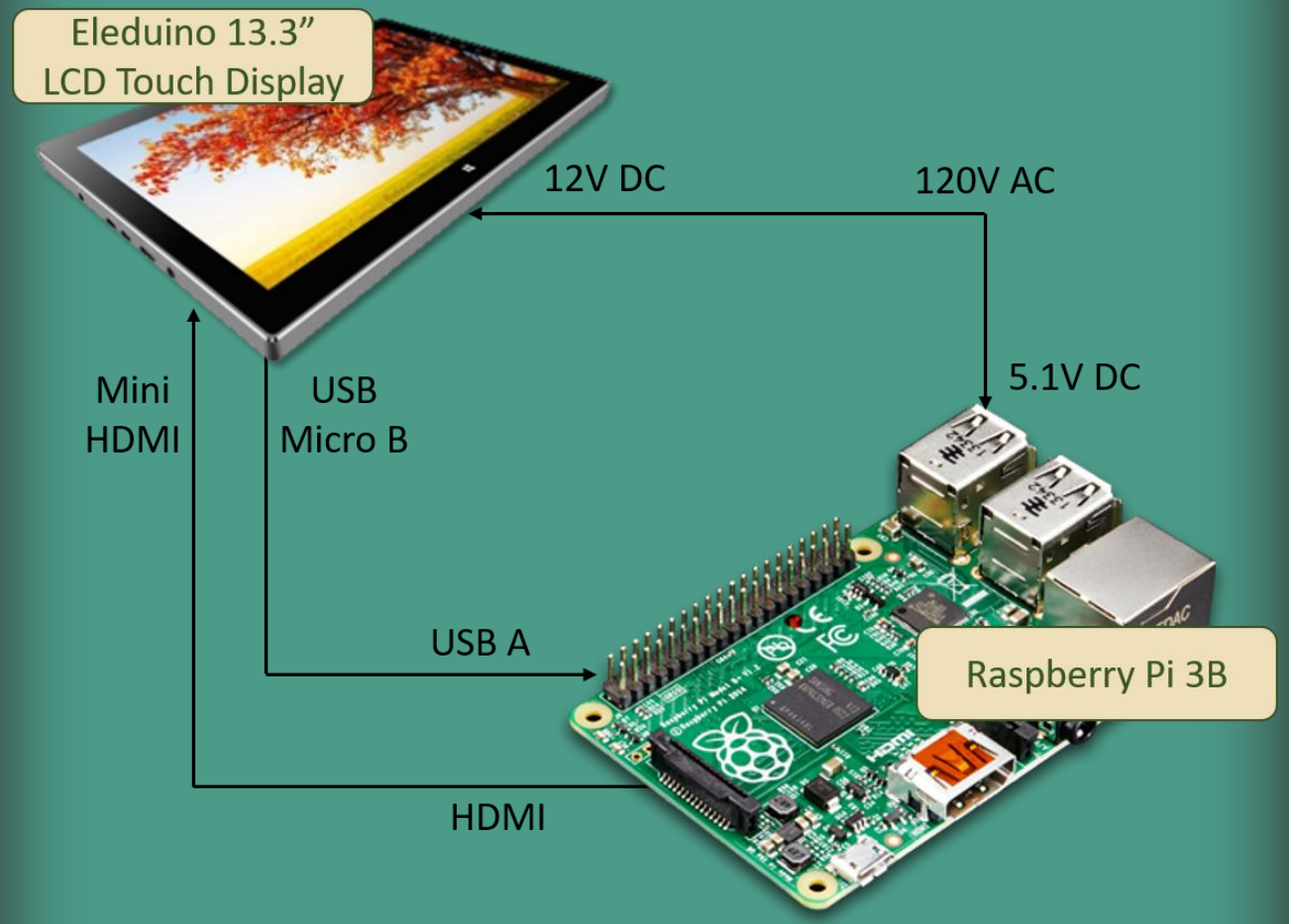
Minimum Functionality Requirements

- Daily calendar data
- Short memos/announcements
- Advertisements
- Paging function with geofencing
- Current and forecast weather data
- Attractive, user-friendly interface

Additional Proposed Functionality

- Sensors
  - Camera
  - Door sensor
- Online Expansion
  - Remote usability
  - Get notified on certain updates in an easy-to-read format
  - See a broader week schedule without having to look in-person
  - Push notifications to phones and other devices for better spreading of information
- E-mail and/or text instructor from Display
- Appointment Scheduler

System Hardware Flowchart

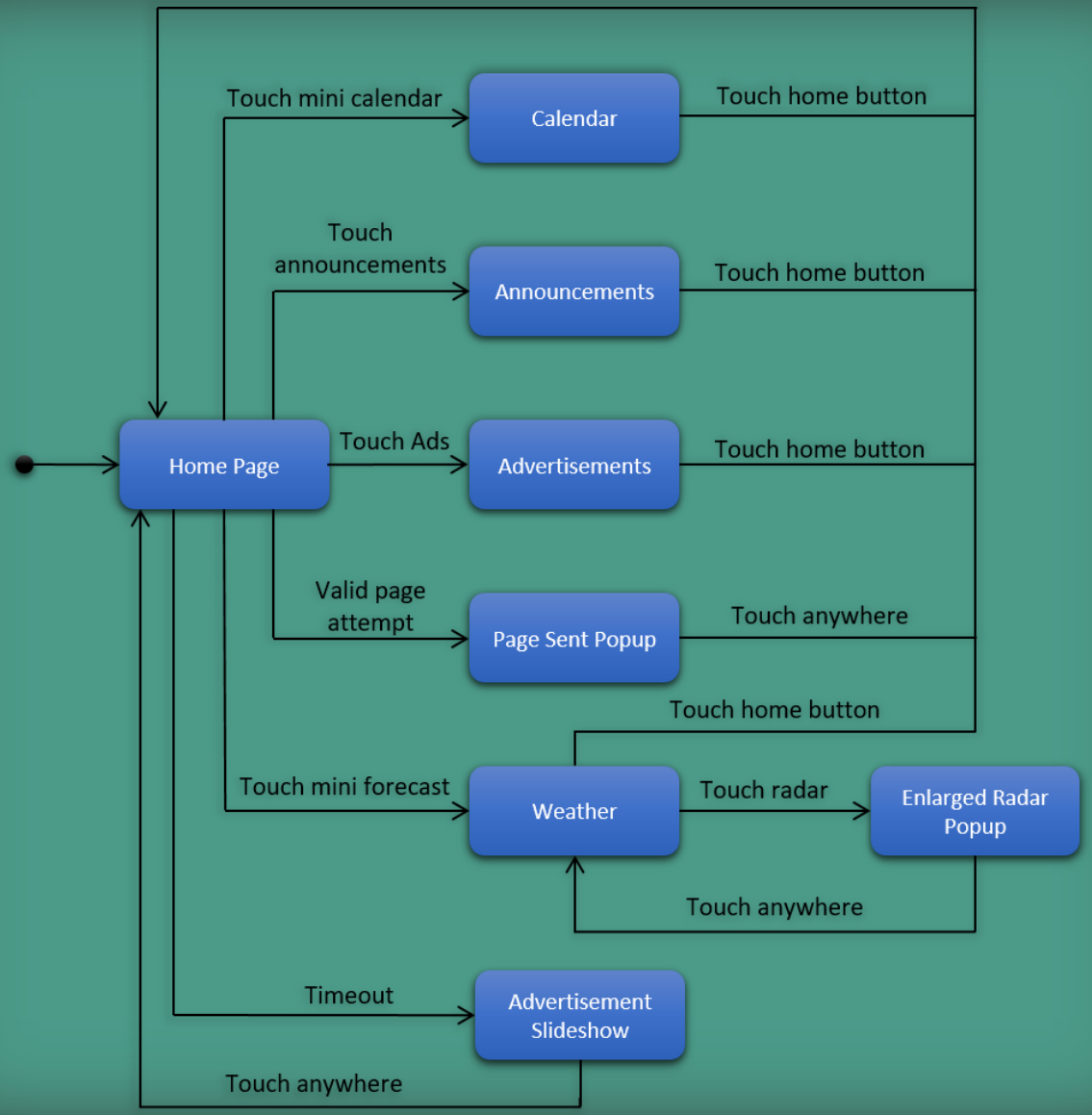


Modes of Operation

- On
  - System is powered and functioning
- Off
  - System is not supplied with power
- Standby
  - Advertisements or
  - Powered but blank screen
  - Reduce power consumption
- Subsystems

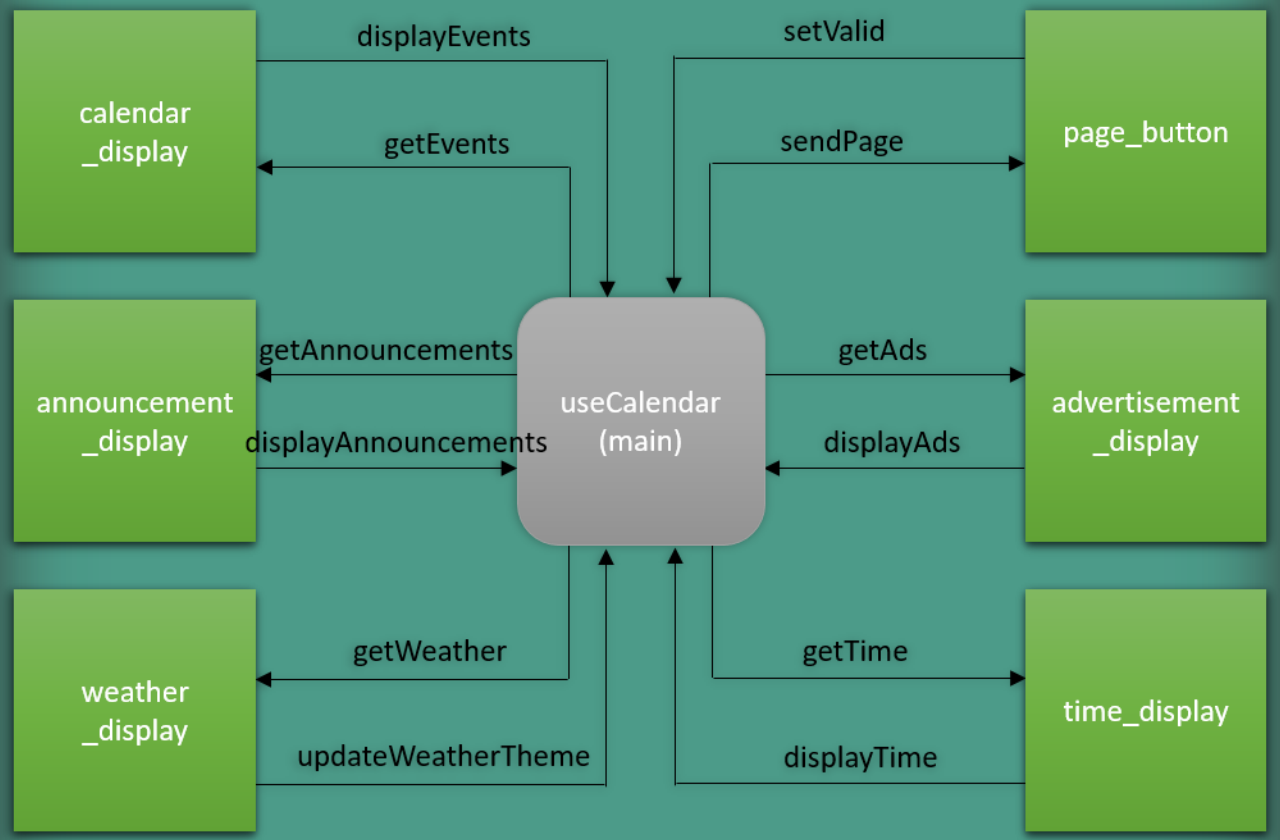
High Level State Transition Diagram

Breaks down steady states of software and transition triggers



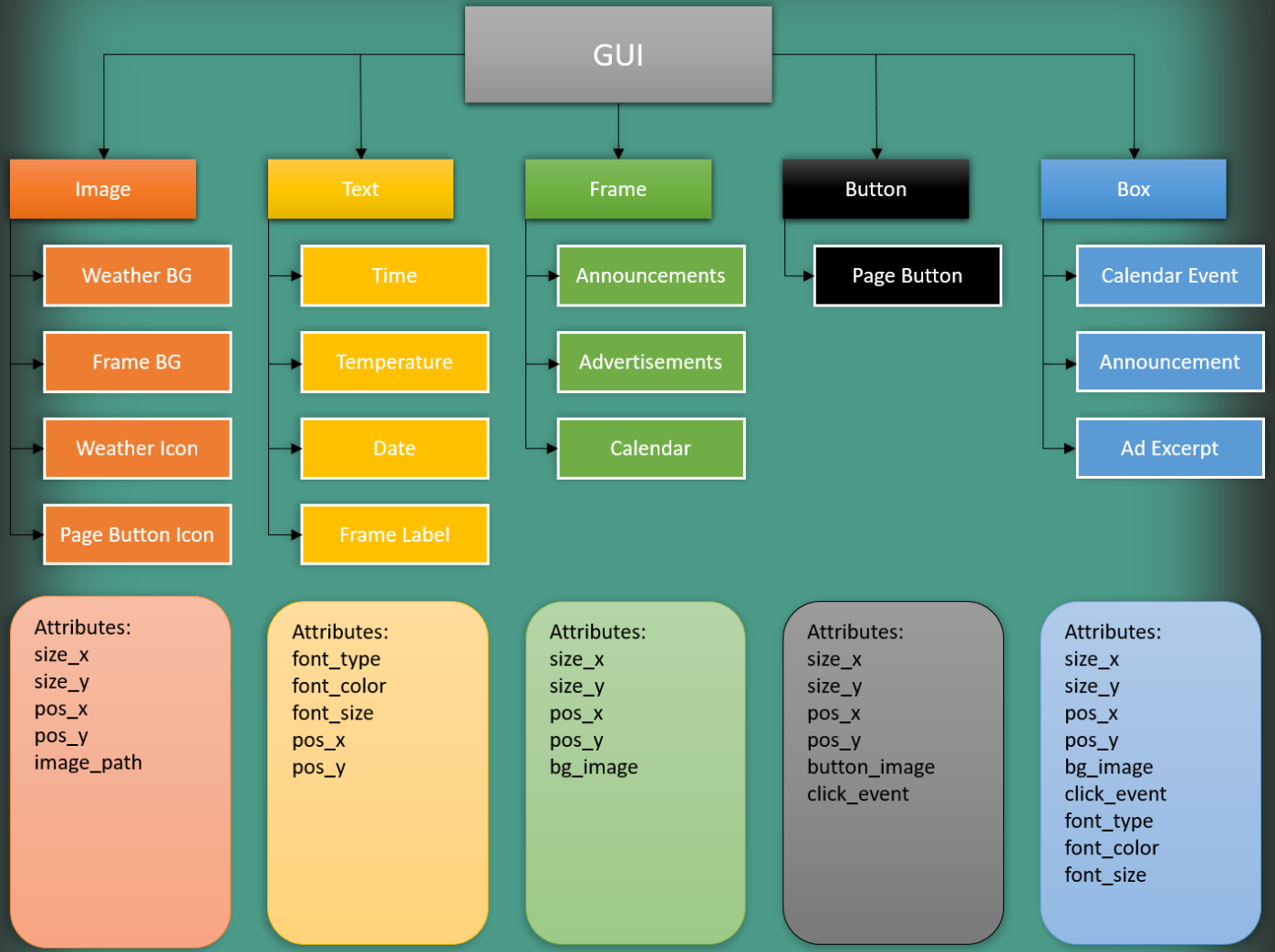
Context Data Flow Diagram

Shows data transfer between main function and subsystems



GUI Design Model

Breaks down GUI elements and major attributes



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Parts List

Qty	Item Description	Source	Price/Unit	Price
1	Eleduino 13.3” 1080P IPS Capacitive Touch Display (sky black)	Amazon.com	$198.00	$189.00
2	CanaKit Raspberry Pi 3 Kit	Amazon.com	$49.99	$99.98
2	SanDisk Ultra 8GB Class 10 UHS-I MicroSDHC	Amazon.com	$9.99	$19.98
1	Rankie Micro HDMI to HDMI Cable, 10 Feet	Amazon.com	$9.99	$9.99
1	Micro USB Cable, 3 Pack 10 ft Braided High Speed USB 2.0 A Male to Micro B	Amazon.com	$10.99	$10.99
			Subtotal:	$329.94

Contents

Existing Products/Projects

DAKboard

- Customizable Interface
- Photos, Calendar, and Weather

Smart Mirror

- (Amazon) Alexa Option
- 2-way mirror with Monitor attached

Raspberry Pi Framed Informational Display

- Monitor enclosed within a frame
- Buttons on side to toggle between sections

Existing Patents

- Content display device with sensors
  https://patents.google.com/patent/WO2016061626A1/en?q=smart

- Smart interactive billboard device
  https://patents.google.com/patent/US20050021393A1/en?q=smart

- Raspberry Pi based smart home control device with touch display
  https://patents.google.com/patent/CN106789459A/en?q=smart

Previous Work (2016-2017)

- Cole Lindeman & Jason Morris
- IoT Smart Calendar
- User and door sensors
- Browser based interface
  - php, HTML, etc.
- Relies on default view for calendar

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Efforts Completed to date

- Design
  - Interactions between user and device
  - Display layout
  - Functionality and added features
- Research
  - Analyze other interactive / informative displays
  - Parts list/ordering
  - Availability of display
  - Self instruction in wxPython module, Twitter, and Google Calendar API
- Graphics & Software
  - Some graphical aspects of the home screen already created
- Environment
  - Raspbian Desktop or Xubuntu
  - Python v2.7
  - Environment installed, configured, and tested on hardware

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Schedule of Deadlines (Fall 2017)

Date	Item Due / Requirement Met
Fall 2017	
11/16/17	Proposal presentation draft *
11/30/17	Project proposal and presentation *
12/7/17	Website with proposal presentation and report *
12/7/17	Non-functional, rough layout prototype for display written in Python
12/7/17	Majority of graphical project aspects created

* Department deliverable deadline

■ Project completion milestone

Schedule of Deadlines (Spring 2018)

Date	Item Due / Requirement Met
Spring 2018	
2/16/18	Working calendar and announcements prototype (API work) with home screen and functional weather icon
2/23/18	Added advertisements and display mounted
3/9/18	Student expo registration *
3/16/18	Paging functionality (Geofence work)
3/23/18	Weather/radar screen
3/29/18	Final report *
4/5/18	Student Expo poster *
4/19/18	Final presentation draft *
5/1/18	All materials completed and uploaded to website *

* Department deliverable deadline

Project completion milestone

Contents

Division of Labor

Benjamin Daszkiewicz

- GUI Programming
  - Main page script will pull returned values of all other functions for display
- Calendar section
  - Google Calendar API
- Weather functionality
  - Weather change based on current conditions
  - Forecast page/radar display

Jacob Nading

- Graphic components
  - Icon/component design
  - Layout and visual design
- Announcements section
  - Twitter API
- Paging system
  - Geofencing interface
  - Geofencing app selection

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Near Future

- Create solution to screen power dissipation
  - Measure power consumption and amperage drawn
- Create ”dummy” interface using wxPython module
- Finish major graphics images for use in GUI homescreen
- Come up with mounting solution
  - Should be designed with screen cooling in mind

Contents

References – existing projects

IoT Smart Calendar – Jason Morris, Cole Lindeman

http://ee.bradley.edu/projects/proj2017/iotsc/index.html

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References – information

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  - https://developers.google.com/google-apps/calendar/
- Twitter API
  - https://developer.twitter.com/en/docs
- wxPython
  - https://www.wxpython.org/
- wxPython Wiki
  - https://wiki.wxpython.org/

Questions