Robotics Club

Science and Technology Council

Indian Institute of Technology, Kanpur

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Digital Photo Frame And Medicine Dispnser

Detailed Report

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Contents

1 Abstract

Our Project aims at buiding a digital photo frame with medicine dispenser.The photo frame will display slideshow of the pictures sent by a person from his android phone.The photo frame will help the person to remain connected to his parents or grandparents by the images sent from him.Also it has a medicine dispenser which will dispense the medicine at given time ,so as to help elserly people their medicine who forget to take their medicine and no one is at home. Our project comprises of programming and mechanical.

Programming was implemented through Android Studio.In Android Studio Volley and Download Manager are used.Also a server is setup using localhost.

Mechanical part consists of designing medicine dispenser.Solidworks was used to design it on the computer.The medicine dispenser are described in the sections folloewing. The dispenser was controlled through arduino which will allow it to communicate the settings give by the android app.

2 Introduction

2.1 Digital Photo Frame

A digital photo frame (also called a digital media frame) is a picture frame that displays digital photos without the need of a computer or printer. The introduction of digital photo frames predates tablet computers, which can serve the same purpose in some situations; however, digital photo frames are generally designed specifically for the stationary, aesthetic display of photographs and therefore usually provide a nicer-looking frame and a power system designed for continuous use.With the pictures the photo frame also displays reminders and also controls the medicine dispenser.The main aim to design the photoframe is to make it useful to people who cannot use smartphones and facebook.

2.2 Medicine Dispenser

Medicine dispensers are items which release medication at specified times. Their purpose is to help senior citizens and other people who may suffer from impaired ability to adhere to their prescribed medication regime.

"Medicine Dispensers" are commonly used to serve medical purposes, but it is also user to help individuals, be that the elderly or chronically ill, take their prescription medication, OTC medication or daily supplements at a given date and time. There are tele-health products in the health care industry such as automated or electronic pill boxes that function to alert the patients when it is time to take their medications.

2.3 Android

Android is a mobile operating system (OS) currently developed by Google, based on the Linux kernel and designed primarily for touchscreen mobile devices such as smartphones and tablets.

Android's source code is released by Google under open source licenses, although most Android devices ultimately ship with both open source and proprietary software, including required proprietary components for Google's services. It is popular with technology companies that require an optimized, low-cost and customizable operating system for high-tech devices.Its open nature has encouraged a large community of developers and enthusiasts to use the open-source code as a foundation for community-driven projects, which add new features for advanced users or bring Android to devices originally shipped with other operating systems.

In this project the Android platform has been used for making the user end app.

2.4 Arduino

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Soft-

ware (IDE), based on Processing. Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users. It runs on Mac, Windows, and Linux. Arduino is a key tool to learn new things. Anyone - children, hobbyists, artists, programmers - can start tinkering just following the step by step instructions of a kit, or sharing ideas online with other members of the Arduino community.

Arduino simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems:

Inexpensive - Arduino boards are relatively inexpensive compared to other microcontroller platforms.

Cross-platform - The Arduino Software (IDE) runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.

Simple, clear programming environment - The Arduino Software (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. The arduino software is easy to learn,for instance, in our project we needed roughly just 2 to 3 days to become proficient in the use of it's IDE.

Open source and extensible software - The Arduino

software is published as open source tools, available for extension by experienced programmers.

In this project arduino was used to control the medicine dispenser.Arduino is use to give instructions to the motors through code written in python.

3 Softwares Used

3.1 Android studio

Android Studio is Android's official IDE. It is purpose built for Android to accelerate your development and help you build the highest-quality apps for every Android device.

It offer tools custom-tailored for Android developers, including rich code editing, debugging, testing, and profiling tools New features are expected to be rolled out with each release of Android Studio. The following features are provided in the current stable version.

Gradle-based build support.

Android-specific refactoring and quick fixes.

Lint tools to catch performance, usability, version compatibility and other problems.

ProGuard integration and app-signing capabilities.

Template-based wizards to create common Android designs and components.

A rich layout editor that allows users to drag-and-drop UI components, option to preview layouts on multiple screen configurations.

Support for building Android Wear apps Built-in support for Google Cloud Platform, enabling integration

with Google Cloud Messaging and App Engine.

Installation

Android Studio can be installed from link below:-

https://developer.android.com/studio/index.html?gclid=CJym5eajwM0CF

3.2 Java Development Kit

The Java Development Kit (JDK) is an implementation of either one of the Java Platform, Standard Edition, Java Platform, Enterprise Edition or Java Platform, Micro Edition platforms[1] released by Oracle Corporation in the form of a binary product aimed at Java developers on Solaris, Linux, Mac OS X or Windows. The JDK includes a private JVM and a few other resources to finish the development of a Java Application.Since the introduction of the Java platform, it has been by far the most widely used Software Development Kit (SDK). On 17 November 2006, Sun announced that they would release it under the GNU General Public License (GPL), thus making it free software.

JDK was used in our project to code in java in android studio.The user end app was made on android studio.

Installation JDK8 can be installed from the link below :-

http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html

3.3 Raspbian

Raspbian is a Debian-based computer operating system for Raspberry Pi, developed by a small team of developers. It is not affiliated with the Raspberry Pi Foundation,

but the foundation provides a Raspbian image which is listed as an officially supported operating system. Raspbian is maintained by Mike Thompson and Peter Green et al. which completed the initial build in June 2012. The operating system is still under active development.

Installation

Raspbian can be installed from the following link:-

https://www.raspberrypi.org/downloads/raspbian/

3.4 Solidworks

SolidWorks, is a solid modeling computer-aided design (CAD) and computer-aided engineering (CAE) computer program that runs on Microsoft Windows. SolidWorks is published by Dassault Systm. SolidWorks currently markets several versions of the SolidWorks CAD software in addition to eDrawings, a collaboration tool, and DraftSight, a 2D CAD product. SolidWorks files (previous to version 2015) use the Microsoft Structured Storage file format. This means that there are various files embedded within each SLDDRW (drawing files), SLDPRT (part files), SLDASM (assembly files) file, including preview bitmaps and metadata sub-files. Various third-party tools (see COM Structured Storage) can be used to extract these sub-files, although the subfiles in many cases use proprietary binary file formats.

We used solidworks to design medicine dispenser.

Installation

Solidworks can be installed from the following limk:-

http://www.solidworks.com/sw/purchase/solidworks-trial.htm

3.5 Arduino Software

The Arduino project provides the Arduino integrated development environment (IDE), which is a cross-platform application written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It is designed to introduce programming to artists and other newcomers unfamiliar with software development. It includes a code editor with features such as syntax highlighting, brace matching, and automatic indentation, and provides simple one-click mechanism to compile and load programs to an Arduino board. A program written with the IDE for Arduino is called a "sketch".[19]

The Arduino IDE supports the languages C and C++ using special rules to organize code. The Arduino IDE supplies a software library called Wiring from the Wiring project, which provides many common input and output procedures. A typical Arduino C/C++ sketch consist of two functions that are compiled and linked with a program stub main() into an executable cyclic executive program:

setup(): a function that runs once at the start of a program and that can initialize settings.

loop(): a function called repeatedly until the board powers off. After compiling and linking with the GNU toolchain, also included with the IDE distribution, the Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal coding that is loaded into the Arduino board by a loader program in the board's firmware.

Installation
Arduino can be instaled from the following link :-
https://www.arduino.cc/en/Main/Software

4 Hardware

4.1 Raspberry Pi

The Raspberry Pi is a series of credit card-sized single-board computers developed in the United Kingdom by the Raspberry Pi Foundation with the intent to promote the teaching of basic computer science in schools and developing countries. The original Raspberry Pi and Raspberry Pi 2 are manufactured in several board configurations through licensed manufacturing agreements with Newark element14 (Premier Farnell), RS Components and Egoman. The hardware is the same across all manufacturers. The firmware is closed-source.

Several generations of Raspberry Pi's have been released. The first generation (Pi 1) was released in February 2012 in basic model A and a higher specification model B. A+ and B+ models were released a year later. Raspberry Pi 2 model B was released in February 2015 and Raspberry Pi 3 model B in February 2016. These boards are priced between 20 and 35 US$. A cut down "compute" model was released in April 2014 and a Pi Zero with smaller footprint and limited IO (GPIO) capabilities released in November 2015 for 5 US$.

Raspberry pi will serve as base for photo frame end.It has raspbian installed on it.Raspbian will serve as operating system on which photo frame will work.

4.2 Arduino Hardware

An Arduino board historically consists of an Atmel 8-, 16- or 32-bit AVR microcontroller (although since 2015 other makers' microcontrollers have been used) with complementary components that facilitate programming and incorporation into other circuits. An important aspect of the Arduino is its standard connectors, which let users connect the CPU board to a variety of interchangeable add-on modules termed shields. Some shields communicate with the Arduino board directly over various pins, but many shields are individually addressable via an IC serial busso many shields can be stacked and used in parallel. Before 2015, Official Arduinos had used the Atmel megaAVR series of chips, specifically the ATmega8, ATmega168, ATmega328, ATmega1280, and ATmega2560. In 2015, units by other producers were added. A handful of other processors have also been used by Arduino compatible devices. Most boards include a 5 V linear regulator and a 16 MHz crystal oscillator (or ceramic resonator in some variants), although some designs such as the LilyPad run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions. An Arduino's microcontroller is also pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory, compared with other devices that typically need an external programmer. This makes using an Arduino more straightforward by allowing the use of an ordinary computer as the programmer. Currently, optiboot bootloader is the default bootloader installed on Arduino UNO.

4.3 Servos

1. hs-422

Specifications:

i. Motor Type: 3 Pole

ii. Bearing Type: Dual Oilite

iii. Speed (4.8V/6.0V): 0.21 / 0.16 sec @ 60 deg.

iv. Torque oz./in. (4.8V/6.0V): 46 / 57

v. Torque kg./cm. (4.8V/6.0V): 3.3 / 4.1

vi. Size in Inches: 1.59 x 0.77 x 1.44

vii. Size in Millimeters: 40.39 x 19.56 x 36.58

viii. Weight ounces: 1.60

ix. Weight grams: 45.36

2. rki-1212

Specifications:

i. Required Pulse: 3-5 Volt Peak to Peak Square Wave

ii. Operating Voltage: 4.8-6.0 Volts

iii. Operating Temperature Range: -10 to +60 Degree C

iv. Operating Speed (4.8V): 0.12sec/60 degrees at no load

v. Operating Speed (6.0V): 0.10sec/60 degrees at no load

vi. Stall Torque (4.8V): 1.8kg/cm

vii. Stall Torque (6.0V): 2.4kg/cm

viii. 360 Modifiable: Yes

ix. Bearing Type: Ball Bearing

x. Gear Type: Nylon Gears

xi. Connector Wire Length: 12”

xii. Dimensions: 22x11.5x27mm

xiii. Weight: 11g

5 Server

We set up our own local server on apache to establish connecton between our app and the photo frame.It was installed on ubuntu operating system .The Apache HTTP Server, colloquially called Apache, is the world's most used web server software. In 2009, it became the first web server software to serve more than 100 million websites.

Apache is developed and maintained by an open community of developers under the auspices of the Apache Software Foundation. Most commonly used on a Unix-like system (usually Linux), the software is available for a wide variety of operating systems besides Unix, including eComStation, Microsoft Windows, NetWare, OpenVMS, OS/2, and TPF. Released under the Apache License, Apache is free and open-source software.

We also installed mysql and php on the server

5.1 Mysql

MySQL is an open-source relational database management system (RDBMS). In July 2013, it was the world's second most widely used RDBMS, and the most widely used open-source clientserver model RDBMS. For proprietary use, several paid editions are available, and offer additional functionality.

MySQL is a popular choice of database for use in web applications, and is a central component of the widely used LAMP open-source web application software stack (and other "AMP" stacks). LAMP is an acronym for

"Linux, Apache, MySQL, Perl/PHP/Python". Free-software open-source projects that require a full-featured database management system often use MySQL. Applications that use the MySQL database include: TYPO3, MODx, Joomla, WordPress, phpBB, MyBB, Drupal and other software. MySQL is also used in many high-profile, large-scale websites, including Google (though not for searches), Facebook, Twitter, Flickr, and YouTube. On all platforms except Windows, MySQL ships with no GUI tools to administer MySQL databases or manage data contained within the databases. Users may use the included command line tools, or install MySQL Workbench via a separate download.

5.2 php

PHP is a server-side scripting language designed for web development but also used as a general-purpose programming language. PHP originally stood for Personal Home Page, but it now stands for the recursive backronym PHP: Hypertext Preprocessor.

PHP code may be embedded into HTML code, or it can be used in combination with various web template systems, web content management systems and web frameworks. PHP code is usually processed by a PHP interpreter implemented as a module in the web server or as a Common Gateway Interface (CGI) executable. The web server combines the results of the interpreted and executed PHP code, which may be any type of data, including images, with the generated web page. PHP code may also be executed with a command-line in-

terface (CLI) and can be used to implement standalone graphical applications.

The standard PHP interpreter, powered by the Zend Engine, is free software released under the PHP License. PHP has been widely ported and can be deployed on most web servers on almost every operating system and platform, free of charge.

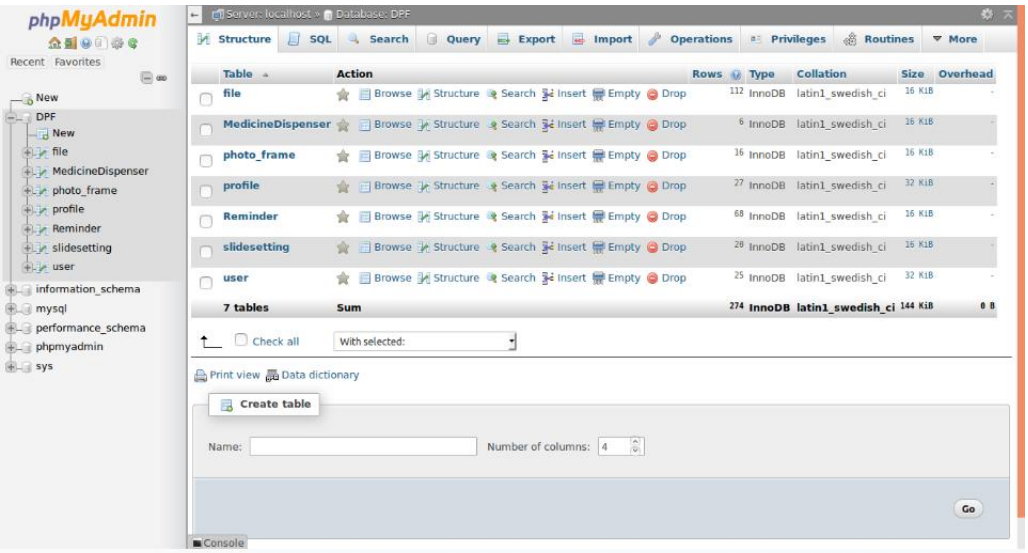
The PHP language evolved without a written formal specification or standard until 2014, leaving the canonical PHP interpreter as a de facto standard. Since 2014 work has gone on to create a formal PHP specification.We installed PHP 7.0 for server side scripting

In our project PHP scripts were used to communicate with the database and server,i.e,upload things like the login and registration details unto the database and images unto the server and retrieving them as and when required.

Installation

Here is a playlist to install php and mysql on the server https://www.youtube.com/playlistlist=PLqyFivnEuNncaWa6$_2$$wqZLz-kF71Rwoie$

The server in phpmyadmin looks like as follows



6 The App Devlopment-the Android and the Web App

The web app was devloped using PHP and HTML scripting languages .It was uploaded unto the same local server used for uploading of images.While the android app was developed on android studio.The language used for back-end app devlopment was java while front-end was developed using XML .To learn android programming we used the official developers.android website(https://developer.android.com) as well as some online tutorials like "The new Boston Android tutorials" and various sources on youtube.To establish connection and upload photos onto the server we used android volley. During the

6.1 Android Volley

Volley is an HTTP library that makes networking for Android apps easier and most importantly, faster. Volley is available through the open AOSP repository.

Volley offers the following benefits:

Automatic scheduling of network requests. Multiple concurrent network connections. Transparent disk and memory response caching with standard HTTP cache coherence. Support for request prioritization. Cancellation request API. You can cancel a single request, or you can set blocks or scopes of requests to cancel. Ease of customization, for example, for retry and backoff. Strong ordering that makes it easy to correctly populate your UI with data fetched asynchronously from the network. Debugging and tracing tools.

Volley excels at RPC-type operations used to populate a UI, such as fetching a page of search results as structured data. It integrates easily with any protocol and comes out of the box with support for raw strings, images, and JSON. By providing built-in support for the features you need, Volley frees you from writing boilerplate code and allows you to concentrate on the logic that is specific to your app.

Volley is not suitable for large download or streaming operations, since Volley holds all responses in memory during parsing. For large download operations, consider using an alternative like Download Manager.

The core Volley library is developed in the open AOSP repository at frameworks/volley and contains the main request dispatch pipeline as well as a set of commonly ap-

plicable utilities, available in the Volley "toolbox." The easiest way to add Volley to your project is to clone the Volley repository and set it as a library project.

Volley can be included in android studio by writing following command in the dependencies in gradle(app module)

dependencies{ compile 'com.mcxiaoke.volley:library-aar:1.0.0' }

6.2 Download Manager

To download multiple images we used download manager class. The download manager is a system service that handles long-running HTTP downloads. Clients may request that a URI be downloaded to a particular destination file. The download manager will conduct the download in the background, taking care of HTTP interactions and retrying downloads after failures or across connectivity changes and system reboots. Instances of this class should be obtained through getSystemService(String) by passing DOWNLOAD_SERVICE.

Apps that request downloads through this API should register a broadcast receiver for ACTION_NOTIFICATION_CLICKED to appropriately handle when the user clicks on a running download in a notification or from the downloads UI. Note that the application must have the INTERNET permission to use this class.

6.3 Source Code

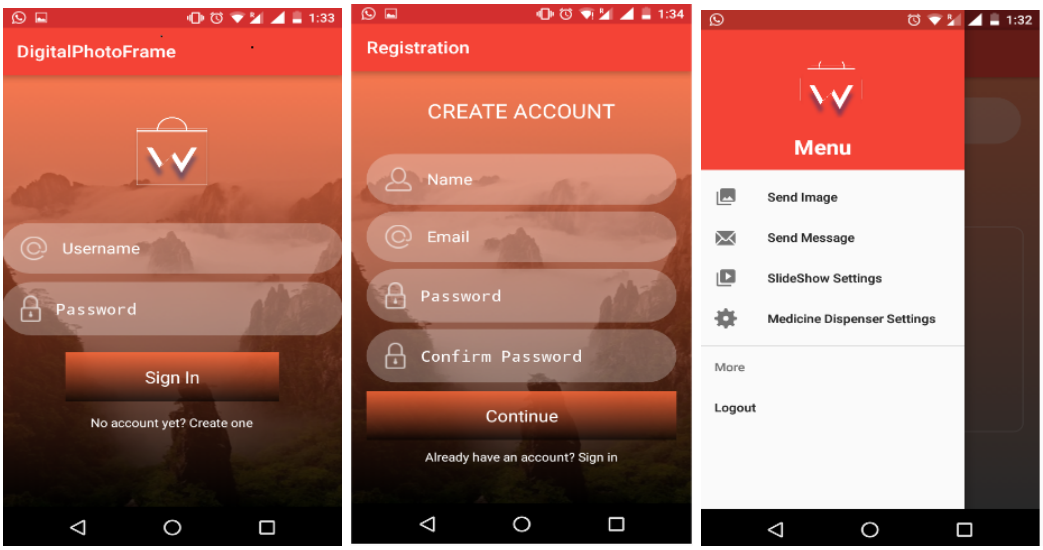
Our android app and web app code can be found at the github. The link is given below: https://github.com/abhinaykdn1/DigitalPhot

https://github.com/abhinaykdn1/DigitalPhotoFrameWebApp.git

6.4 Basic Framework Of The App

6.4.1 User-End App

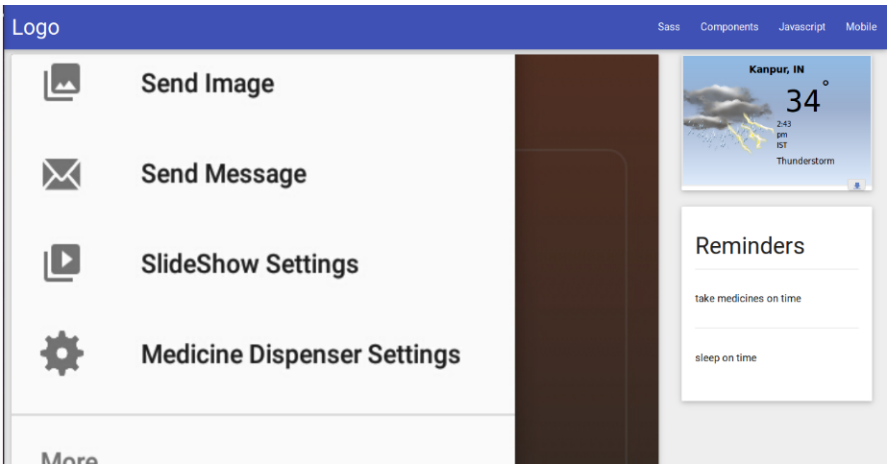
User end app was designed on android studio.The app could upload pictures.It can send reminders, set settings of slide show and also give the settings of medicine dispenser.Following are the screen shots of the app.



6.4.2 Photo Frame End App

On photoframe end a web app is designed.Web Applications are those which have similar functionality to a desktop software application, or to a mobile app. HTML5 introduced explicit language support for making applications that are loaded as web pages, but can store data locally and continue to function while offline.Through Java application-specific methods such as drawing on the

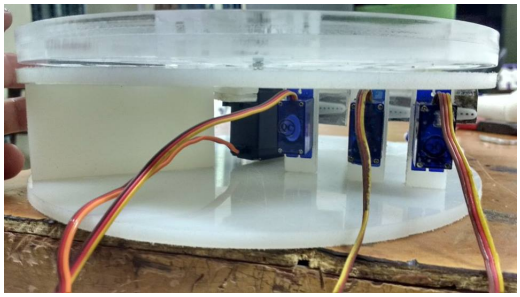
screen, playing audio, and access to the keyboard and mouse are all possible. Web developers often use client-side scripting to add functionality, especially to create an interactive experience that does not require page reloading.The app can display slide show and reminders.also it shows weather report.It automatically downloads the pictures and also retrieves the settings for medicine dispenser.The user need to login through the web app when using first time.Following is the interface showing the picture of menu,weather and reminders



6.5 Medicine Dispenser

Medicine Dispencer is circular in shape.It has seven slots for seven days and each slot has three sections for giving medicine three times a day.The base of the dispenser is made up of nylon sheet.The rotating layer is made of acrylic sheet.The nylon was cut by water jet and acrylic by laser cutting machine .The upper layer rotates and the desired medicine is dispatched.The outer diameter of the dispenser is 214 millimetres.The three slots are at radii of

23.33 mm ,60.33 mm and 86.67 mm respectively.Three servos are used to open the three gates.The medicine dispenser looks like

7 References

How to learn Android Programming in Android Studio
https://thenewboston.com/videos.php?cat=278
www.simplifiedcoding.com
https://developer.android.com/training.

How to learn Solidworks
https://www.solidworks.com/sw/resources/solidworks-tutorials.htm

How to learn arduino
https://www.arduino.cc/en/Tutorial/HomePage