SMART MOTORCYCLE HELMET

CPRE 186 Project

Nathan Perkins, Matthew Stevens, Owen Jewell

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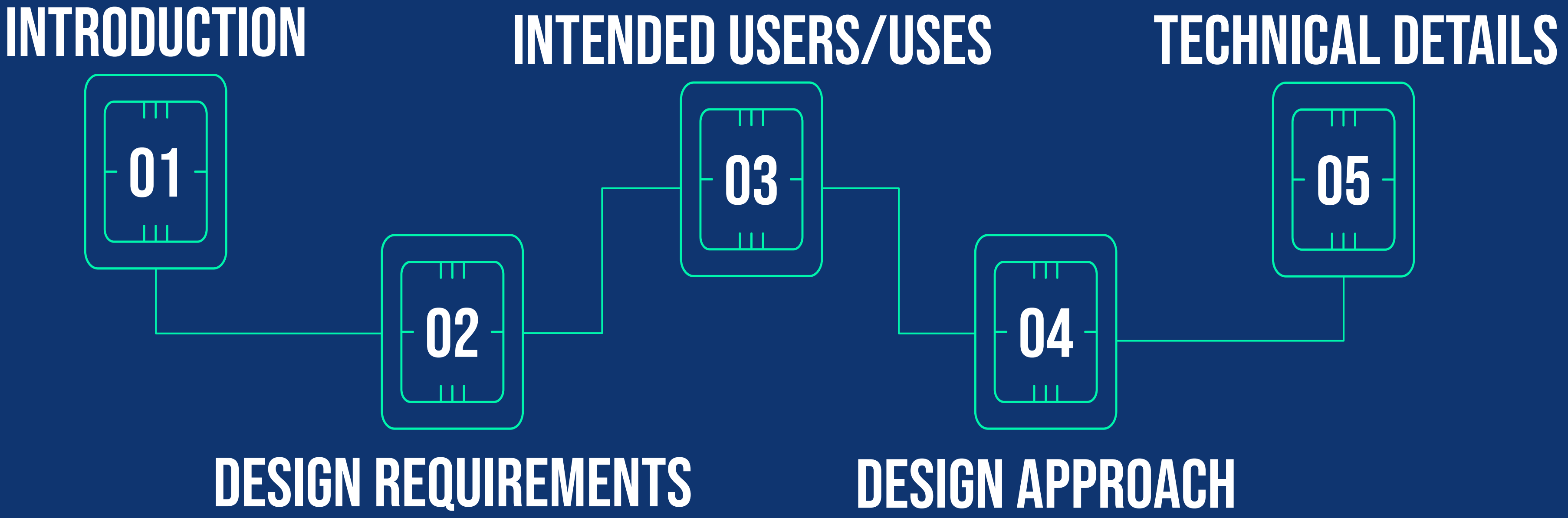

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01

INTRODUCTION

PROBLEM STATEMENT

Need: A product that can detect an accident and notify emergency services to decrease response times

- ❑ The median response time for an ambulance to the scene of a motor vehicle crash (MVC) is 9 minutes and increases in rural areas (National Library of Medicine)
- ❑ After 12 minutes, the mortality rate of MVC's double compared to a 7 minute response time (NEJM)
- ❑ 42% of all motorcycle accidents are single-vehicle crashes (Dolman Law Group)
- ❑ Reducing the median response time to 7 minutes could prevent 13% of MVC fatalities (NEJM)

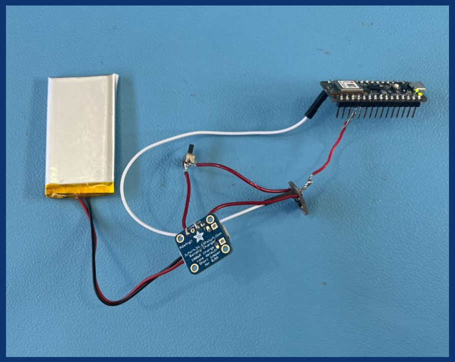
SOLUTION

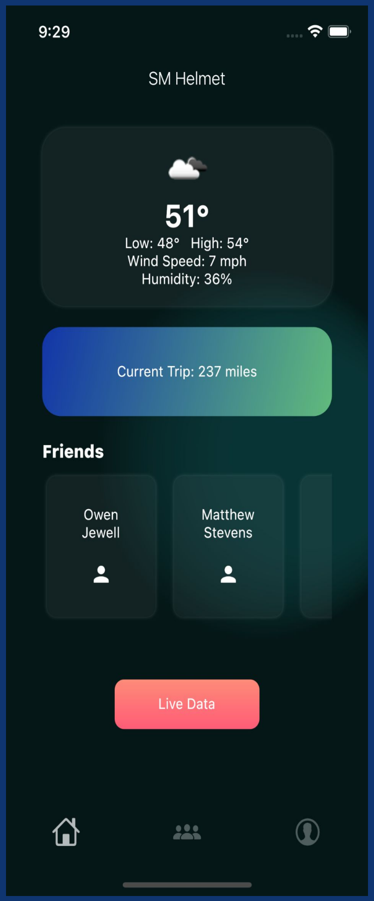
A modification to a motorcycle helmet that can detect accidents and alert first responders as fast as possible

02

DESIGN REQUIREMENTS

OUR DESIGN





9:29

SM Helmet

51°

Low: 48° High: 54°
Wind Speed: 7 mph
Humidity: 36%

Current Trip: 237 miles

Friends

Owen Jewell

Matthew Stevens

Live Data

Primary Goals:

- □ Use an Arduino Nano to transmit data to an app
- □ Use the data to detect accidents
- □ Contact the emergency contacts after an accident

Secondary Goals:

- □ Aesthetically pleasing and easy to use app
- □ Add relevant extra features such as weather (as time allows)

03

INTENDED USERS AND USES

INTENDED USERS

- ❑ Primary: Motorcyclists
  - ❑ Mountain Bikers
  - ❑ Long Distance Cyclists
- ❑ Designed to help protect solo riders
  - ❑ Remote areas
  - ❑ Night traveling

INTENDED USES

- ❑ Report a possible crash when no else is around to see
- ❑ Set an emergency contact
- ❑ View local weather data
- ❑ View a Trip History

04

DESIGN APPROACH

OUR DESIGN APPROACH

APP

- ❏ Create a Flutter app that:
  - ❏ Stores contacts
  - ❏ Sends message via Twilio
- ❏ Add extra features and color scheme

ARDUINO

- ❏ Create a basic skeleton with all data containers
- ❏ Add packages for all sensors on Arduino
- ❏ Add BLE code that transmits data to app

CONCERNS AND LIMITATIONS

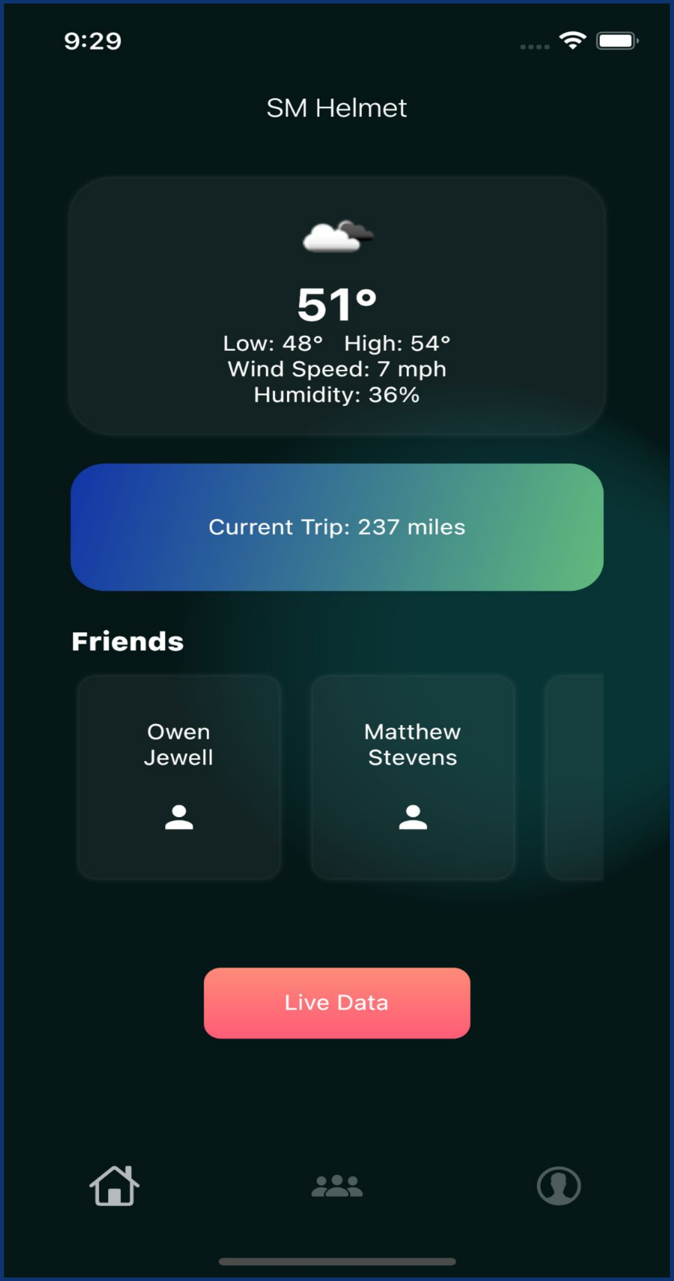
CONCERNS

- ❑ Error in Transmitting data via BLE
- ❑ Error when sending messages via Twilio
- ❑ General State Errors in App

LIMITATIONS

- ❑ No true BLE connection, use manufacturer data
- ❑ Simple crash detection algorithm

APP LAYOUT



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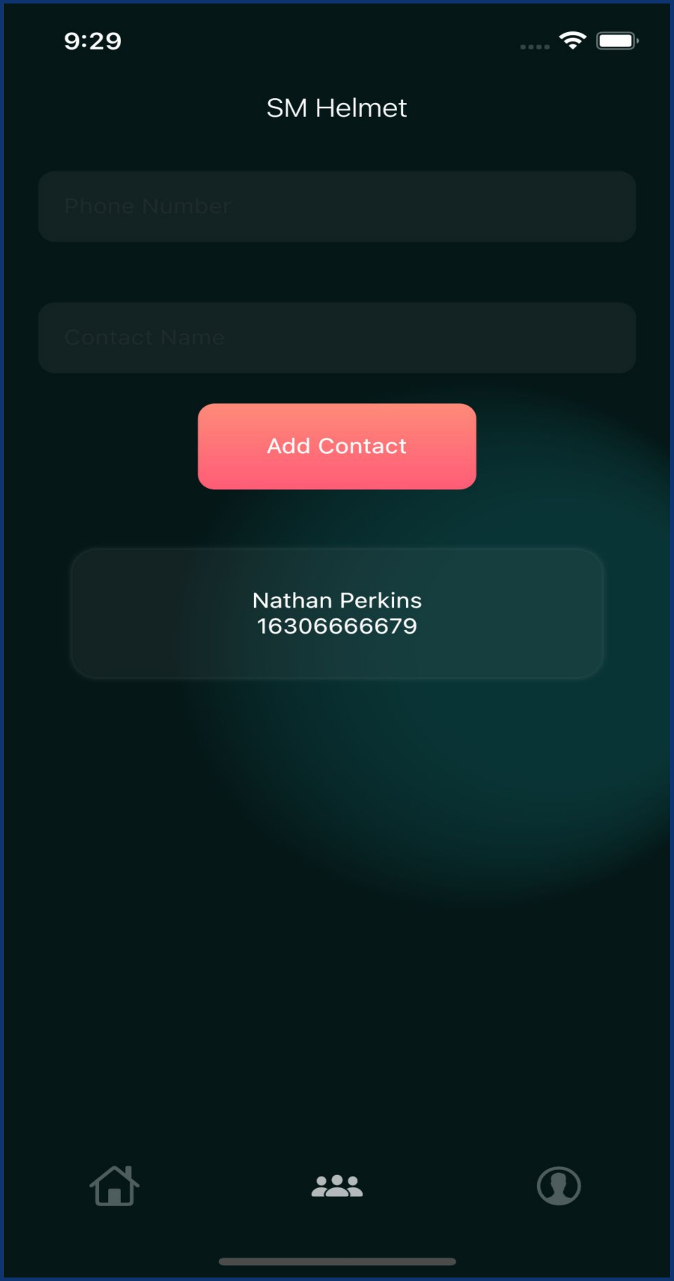
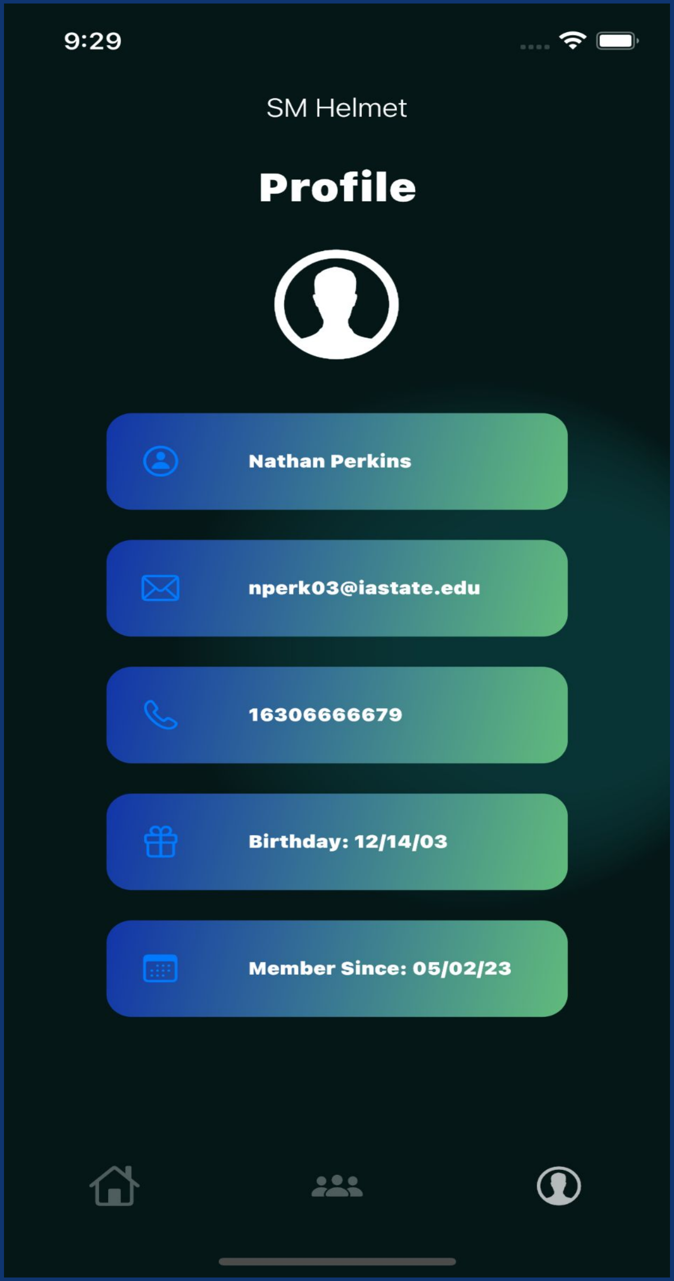


Nathan Perkins
16306666679



Profile

Nathan Perkins

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Birthday: 12/14/03

Member Since: 05/02/23

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TECHNICAL DETAILS

COMPONENTS

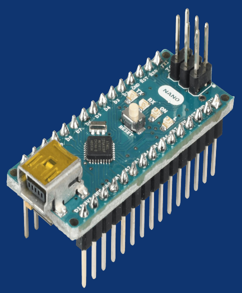
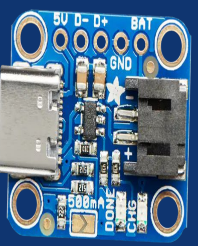
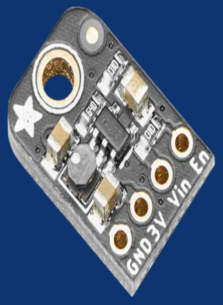
□ Arduino Nano BLE Sense 33 rev 2

□ 3.7 Volt Battery

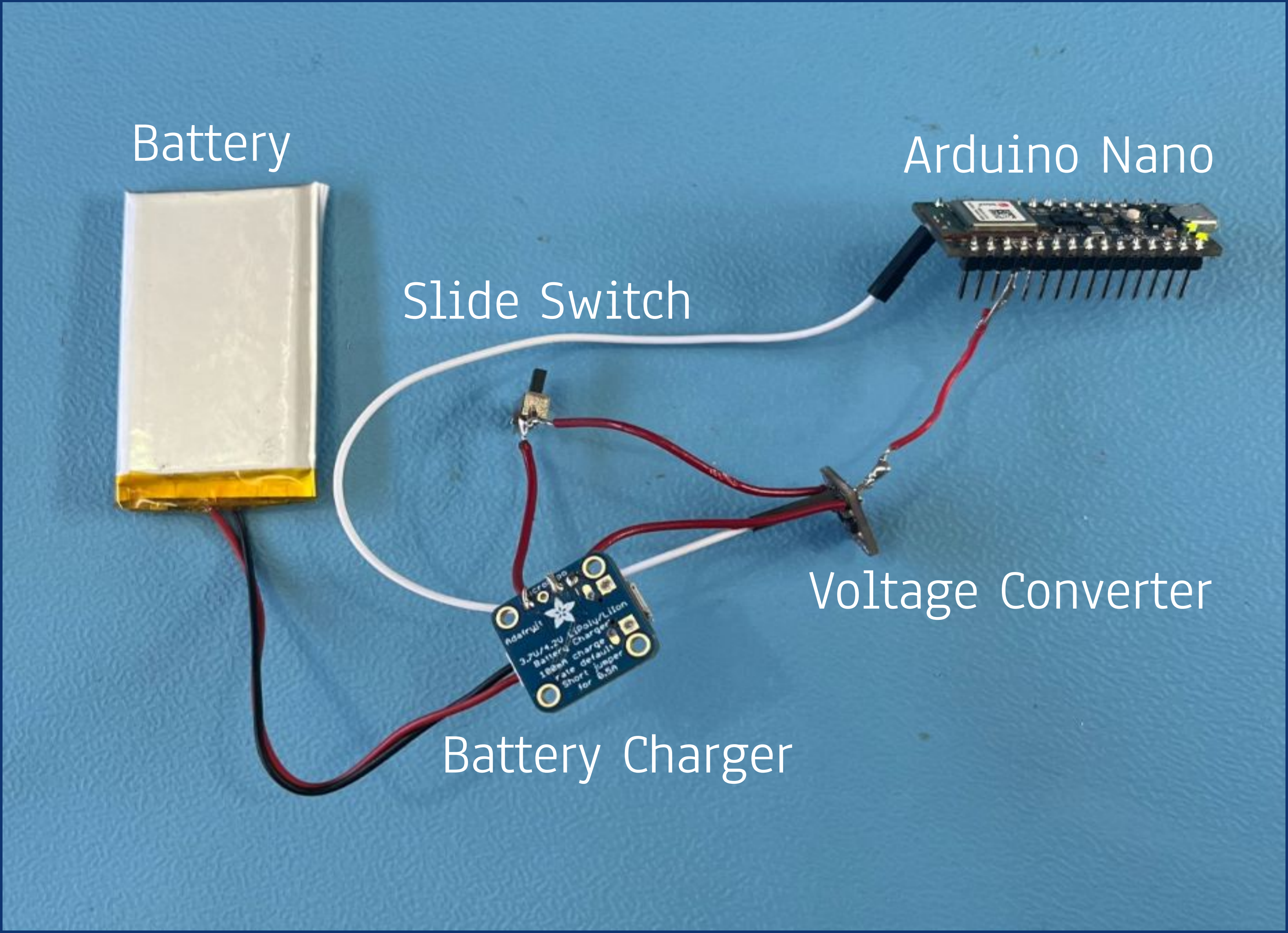
□ Micro-Lipo Battery Charger

□ 3.3 Volt Buck Converter

□ Slide Switch

	Arduino Nano Sense 33 rev 2 - arduino nano with a BLE module and multiple sensors
	Battery - 3.7 Volts - 1200 milliamp hours
	Charger - 500 milliamp per hour charger and battery output
	Converter - takes in the 3.7 volt output from the battery and converts it to 3.3 V

HARDWARE PICTURE



SOFTWARE DETAILS

Programming Language: Dart

Framework: Flutter

Messaging API: Twilio

Arduino Firmware: C++

FLUTTER

Apps Built With Flutter:

❑ BMW

❑ Google Pay

❑ Google Classroom

❑ Toyota Infotainment Systems

❑ PubG Mobile

G Pay

Flutter Framework

❑ A framework intended for creating applications

❑ Develop cross platform applications for iOS, Android, macOS, Windows, Linux

❑ Written in Dart

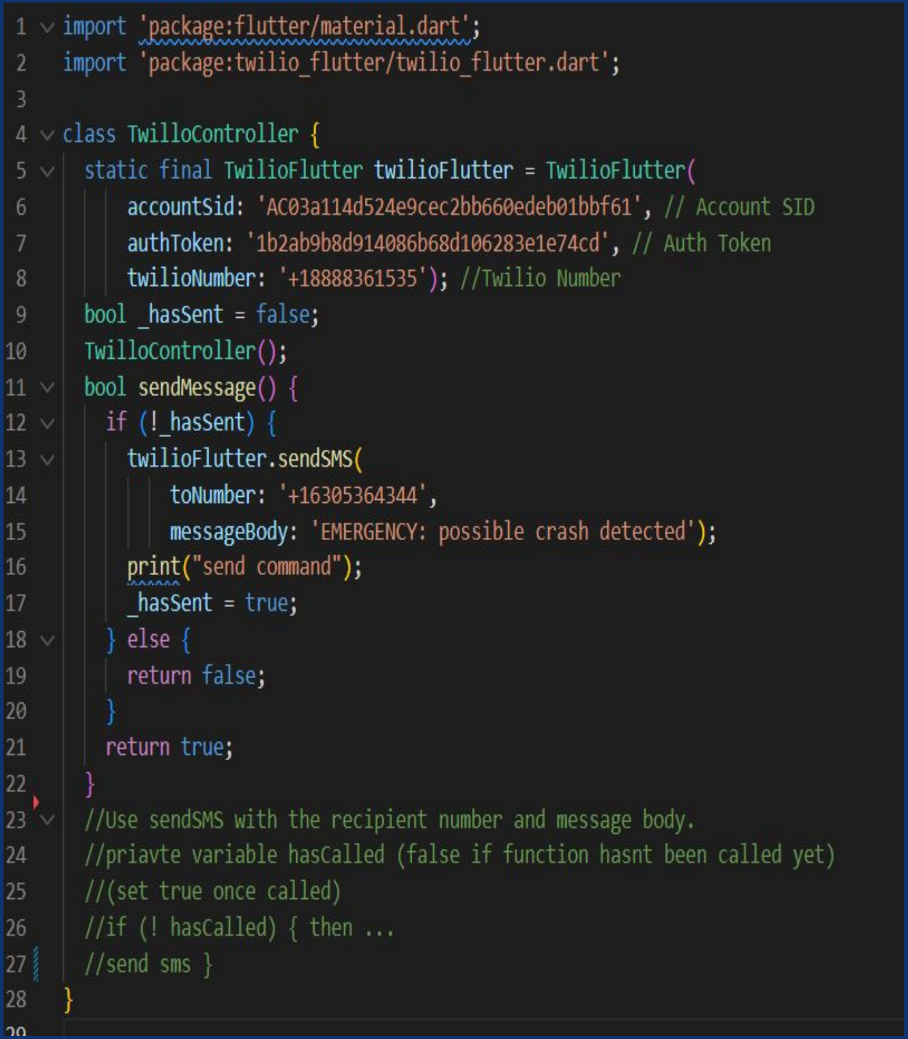
❑ Compiles in native binary

FLUTTER LIBRARIES

- ❑ **Flutter Reactive BLE** - flutter library used to communicate with arduino via BLE
- ❑ **Hive** - local NoSQL database used to store emergency contacts and weather data
- ❑ **Weather** - library used to get weather data from Open Weather API
- ❑ **Provider** - library used to manage state using class models

TWILIO

Flutter Implementation



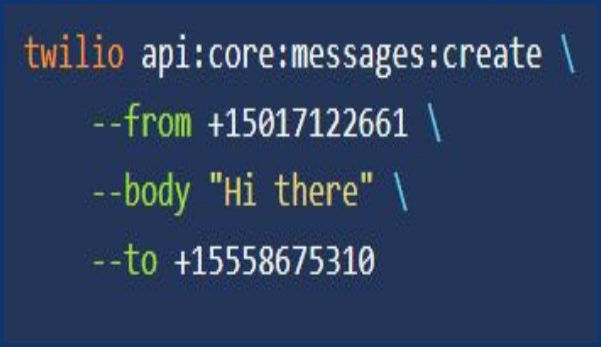
```dart
import 'package:flutter/material.dart';
import 'package:twilio_flutter/twilio_flutter.dart';

class TwilloController {
  static final TwilioFlutter twilioFlutter = TwilioFlutter(
      accountSid: 'AC03a114d524e9cec2bb660edeb01bbf61', // Account SID
      authToken: '1b2ab9b8d914086b68d106283e1e74cd', // Auth Token
      twilioNumber: '+18888361535'); //Twilio Number
  bool _hasSent = false;
  TwilloController();
  bool sendMessage() {
    if (!_hasSent) {
      twilioFlutter.sendSMS(
          toNumber: '+16305364344',
          messageBody: 'EMERGENCY: possible crash detected');
      print("send command");
      _hasSent = true;
    } else {
      return false;
    }
    return true;
  }
  //Use sendSMS with the recipient number and message body.
  //priavte variable hasCalled (false if function hasnt been called yet)
  //(set true once called)
  //if (! hasCalled) { then ...
  //send sms }
}
```

TWILIO - Messaging API

- ❑ Can be used to
  - ❑ Send and Receive SMS text messages
  - ❑ Send and Receive calls
- ❑ Free trial account includes Account SID, Authentication Token, and phone number

Twilio CLI Formatting



```
twilio api:core:messages:create \
    --from +15017122661 \
    --body "Hi there" \
    --to +15558675310
```