Harsh Dubey

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EDUCATION

South Dakota State University: Brookings, SD   **May 2021**
Bachelor of Science: Electrical Engineering

TECHNICAL SKILLS

- Skilled in embedded system and control system design using Microprocessors, Microcontrollers, Programmable Ladder Logic (PLC), Human Machine Interface (HMI), and Field Programmable Gated Array (FPGA).
- Experienced in working with PIC microchip controllers, Arm Cortex processors, Arduino Uno, Arduino Mega, Altera's DE-10 FPGA, and Altera's Cyclone-2 FPGA.
- Skilled in developing firmware in C, Embedded C, C#, C++, and PIC assembly.
- Experienced in writing embedded device driver and working with communication protocols such as I2C, SPI, UART, RS-232, RS-485, USB, WiFi and LoRaWAN.
- Experienced in creating Internet of Things (IoT) enabled embedded devices using The Things Network.
- Skilled in writing Verilog, writing test benches using Model Sim, testing designs using signal tap, performing static timing analysis, and working with other Quartus tools.
- Experienced in working with NIOS 2 processor and other onboard devices on DE-10 and Cyclone-2.
- Skilled in processing digital images and signals using MATLAB, Simulink and PSPICE.
- Skilled in printed circuit board (PCB) design using Eagle and testing it using oscilloscope, and multimeter.
- Experienced in working with CLICK PLC, CMORE HMI, and industrial sensors.
- Skilled in programming PLC with Ladder Logic Diagram, Structured Text, Sequential Functional Charts, Function Block Diagram, and Instruction List.
- Skilled in programming HMIs and safety controllers.
- Experienced in updating and designing industrial control systems and electrical control panels.
- Skilled in frontend development using HTML, CSS, JavaScript and backend development using Google Firebase.

WORK EXPERIENCE

Embedded Systems Engineer

South Dakota State University, Agricultural and Biosystems Engineering | Brookings, SD **| Jan 2020-present**

Designing a remote monitoring system for a swine facility that will allow users to monitor/observe the operating status of feeders, fans, and heaters through a website; using sensor nodes connected to the network server and a network gateway.

- Designed and engineered a non-invasive and easy to use LoRaWAN enabled sensor node using Arduino Uno, Arduino Mega, and a LoRaWAN shield for long-distance transmission of data to a network gateway.
- Designed a C# interface that will receive data using UART from an Arduino and send it to the website's backend.
- Designing the website's backend using Google Firebase.
- Developing website's frontend using Brackets in HTML, CSS, and JavaScript.
- Designing the network gateway connection using The Things Network.

Controls Engineer

Banner Engineering | Aberdeen, SD **| May 2019- August 2019**

Designed a PCB fixture for the line employees to hold the PCBs and keep them stable while they soldered components on it. Automated six industrial ovens by creating a timer system for them to avoid the errors associated in manual time tracking. Also designed electrical control panels and updated the existing designs.

- The PCB fixture was designed using the CLICK PLC, Banner safety controller, relays, and Banner touch photo-electric sensor.
- The oven timer system was designed to accept and record heating time and update employees once the devices are heated. The timer was designed using the CLICK PLC, CMORE HMI, Indicator light and photo-electric sensor.
- Designed neat and easy to fix control panels for the ovens and conveyors belts in the Banner production facility.
- Functioned as a project manager overseeing the installation of control panels and ordering materials.

Electrical Engineering Research Assistant

South Dakota State University, Math and Computer Science | Brookings, SD | **August 2018- May 2019**

Developed a gaming system that is reactive to the player's brain status. The gaming system's internal logic will trigger different game events while measuring player's brain response using the Electroencephalography signals (EEG) headset. And later build the player's profile that will be used to train a machine learning model.

- Researched and created an emotion model that can be used to classify player's brain responses from the EEG signal acquired from the Open BCI EEG headset.
- Collaborated on creating a 2D space shooter game with 3-levels (easy, medium, and hard) using Unity game engine.
- Collaborated on creating a machine learning model using Keras and TensorFlow.

Senior Design – Embedded System Design

Daktronics Inc. | Brookings, SD |**August 2019 – May 2020**

Designed a configuration dongle to fetch and reconfigure Daktronics' display controller's network settings without the use of any form of network. The dongle was designed to communicate using USB 2.0 and change network mode, hostname, IPv4 address, netmask, and gateway of the display controller. A Window's device driver was developed for the display controller to recognize and initiate communication with the dongle.

- Configuration dongle was designed using ATSAMD21 Arm Cortex processor. The dongle's firmware was developed using Arduino ide in embedded C. And the Arm Cortex processor was interfaced with an OLED display and tactile pushbuttons to create an easy-to-use user interface.
- A .NET C# application was written to act as a driver for the dongle. The application was also coded to send the current system network settings to the dongle and update them as commanded by the dongle.
- PCB board was designed using Eagle to house the processor, display and pushbuttons.

RELATED EXPERIENCE

Course Projects

Home Energy Management System (HEMS) based on the IoT, Electrical and Computer Engineering |
February 2018 - March 2018

Designed a HEMS to reduce the electricity consumption of the user by controlling load operation time and duration. HEMS was designed to fetch predicted energy prices of the day from the internet, accept temperature profile of the day from the user, read current temperature from a sensor and compare them to decide which load to run at the given hour and for how long in-order to maintain the user desired temperature while reducing electricity consumption.

- The firmware for HEMS was developed on PIC18 microcontroller using embedded C and PIC assembly language.
- The controller was interfaced with an analog temperature sensor, LCD display, pushbutton, HEX display to create a user interface and was connected to a personal computer to accept energy prices using UART.
- HEMS was tested by interfacing a fan and a heater and by controlling their run-time.

Smart Tea Kettle using Arm Cortex-M4F Microprocessor, Electrical and Computer Engineering |
February 2018 - March 2018

Updated rival's 1.7-liter cordless tea kettle to a user-controlled smart tea kettle.

- Upgrade included features like interfacing a keypad, adding an LCD screen, adding LEDs, and implementing a control algorithm to control and maintain tea temperature.
- The firmware for the update was developed on Arm Cortex-M4F using embedded C.

Projects using DE-10 FPGA, Cyclone 2 FPGA, and Model Sim, Electrical and Computer Engineering |
January 2016 – present

- Synthesized a 9-bit and a16-bit non-pipelined microprocessor, a stepper motor controller, a multiplier circuit, a vending machine controller, a SEC-DED circuit and a UART module on DE-10 and Cyclone 2 FPGA using Verilog.
- Synthesized and created a gaming console using onboard NIOS 2 softcore processor, onboard PLL, onboard accelerometer, and switches on DE-10 using Verilog. The game was coded in eclipse using C and the VGA monitor was interfaced to the system to use as a display.
- Wrote test benches for all the designs on Model Sim, performed timing analysis, and performed route checking.

ADDITIONAL INFORMATION

GitHub: https://github.com/hdubey-debug?tab=repositories