

Yue ZHU

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EDUCATION

ShanghaiTech University

B.E. in Electronic Information Engineering

Shanghai, China

Aug 2017 - Jun 2021

Core Courses: *Introduction to Embedded Systems, Introduction to Communication Systems, Web and Text Mining, FPGA-based Hardware System Design, Introduction to Control, Machine Learning, Digital Integrated Circuit Design*

RESEARCH INTEREST

Low power system design, Human-Computer Interaction, Internet of Things

RESEARCH EXPERIENCE

Mechatronics and Energy Transformation Laboratory, ShanghaiTech

Research Assistant, Supervisor: Prof. Junrui Liang

Shanghai, China

Jul 2020 - Present

Motion-powered Gameboy

- Implemented the first robust, purely motion-powered, user-friendly battery-free personal mobile gaming device, low refresh rate mobile games such as Sokoban can be developed on the system
- Investigated task-based energy management method, adjusted the amount of energy generated by the bistable energy harvester to adequately meet the Gameboy needs to perform a reaction by pre-designing the mechanical structure
- Employed software-based checkpointing using FRAM so that a snapshot of the present state could survive spanning power outages
- Designed the lever structure and shell to improve user's experience
- [Document and Demo](#) (the research paper is in progress)

Battery-Free QR Tag

- Investigated the battery-free full-duplex BLE node based on mechanical potential energy pre-charging and task-based checkpointing using FRAM
- Optimized energy consumption of E-ink update per frame further from 9mJ to 4.3mJ by optimizing SPI driver and employing FRAM as non-volatile memory
- Developed a bistable display node that could trigger BLE advertising when the energy level was enough for pairing, BLE throughput, and E-ink frame updating
- Developed corresponding WeChat mini-program to automatically fetch the advertising period of the battery-free device
- Realized battery-free reception, QR code update, and battery-free transmission of node's status

Battery-Free E-ink Tag (Capstone Project)

- Designed a battery-free display IoT node by bistable energy harvester and bistable display
- Optimized energy consumption of E-ink update per frame from 72mJ to 9mJ by modifying update strategy with flash-based checkpointing, minimizing idle power consumption, and maximizing the idle period
- Realized battery-free display and battery-free BLE on ViPSN platform

PROJECT EXPERIENCE

Digital Integrated Circuit Design: 4 bits Processor with 16x8 bits SRAM

Jun 2020 - Jul 2020

Advisor: Prof. Xufeng Kou

- Proposed schematic and layout for 4 bits arithmetic logic unit with 16x8 bits data static random access memory
- Optimized the worst-case delay of the ALU and SRAM to below 2ns with mirror adder and logical efforts

Embedded Systems: Multi-capacitors Repeating Coil Gun

May 2020 - Jul 2020

Advisor: Prof. Junrui Liang

- Designed and simulated the schematic based on Arduino and developed corresponding user interface
- Designed PCB by adopting Altium Designer and iterated hardware prototypes
- Optimized the maximum voltage capability from 60V to 150V by replacing power MOSFET with IGBT

NUEDC Project: Black Box RLC Parameter and Structure Detection System

Jul - Aug 2019

Advisor: Prof. Haoyu Wang

- Developed STM32-based black box RLC circuit parameters detection system
- Investigated theoretical characteristic frequencies of RLC combined circuits using Bode Plot
- Developed the embedded C algorithm to classify the structure of the RLC circuit in the black box at selected theoretical characteristic frequencies
- Won the second prize of 2019 TI Cup National Undergraduate Electronic Design Contest, Shanghai Division

Independent Project: Multi-device Collaborative Object Recognition

Nov 2018 - Dec 2018

Open-sourced on [Github](#)

- Realized the edge computing based on PC (user), Raspberry Pi (computing nodes), and Intel Neural Compute Sticks (computing resources)
- Implemented the functionality of collaborative object recognition by employing SMB as the file transfer protocol
- Optimized the time consumption of collaboration per frame to 1.39s (2.21s on PC) by applying the system

How to Write Answers with Stronger Traffic-driving Capability on Quora

Jul 2018 - Aug 2018

Advisor: Prof. Yizhou Lu

- Applied web crawler to fetch two topics: Republican Party and Democratic Party
- Proposed the conclusion that the following five variables were significant in increasing answer's upvote count: length of sentence, lexical diversity, sentiment polarity, readability, and total words counts and subjectivity
- Built model to estimate the future upvotes for new posts, and the final cross-validated accuracy was 89%

AWARDS & HONORS

Best Paper, the 3rd International Conference on Vibration and Energy Harvesting Applications

Paper Name: Dynamic Analysis of a Transient Plucking Energy Harvester towards Battery-free Motion-sensing System [[PDF](#)]

Author: Xin Li, Guobiao Hu, Hong Tang, **Yue Zhu**, Junrui Liang*

2nd Prize, 2019 TI Cup National Undergraduate Electronic Design Contest Shanghai Division

SKILLS

Programming: Embedded C, Linux, FPGA, Web, Web text mining(Python)

Software: Altium Designer, Solidworks, Matlab, Multisim, Proteus, Vivado, Cadence, Adobe

Embedded System Development: low power system design, PCB design, 3D model design