Syed Razwanul Haque

Sylhet, Bangladesh
nabilsust@gmail.com | +8801717973140
www.nabilbd.com | github.com/Nabiphysics | linkedin.com/in/nabilphysics | scholar.google

Summary

With a proven track record of over 10 years in technology product development and research, I have honed my skills in a diverse range of disciplines including Robotics, Embedded Systems, Biomedical Device Development, Firmware Development, AI, IoT, UAV, Circuit Design, and Teaching. Presently, I am engaged in robotics, artificial intelligence, and biomedical engineering, striving to deliver innovative solutions in this cutting-edge field.

Experience

Lead Robotics Engineer

Bengal Champ
March 2023 - October 2023 (8 months)
Responsibilities:
- Design and development of a ROS2-based intelligent poultry Robot.
- Set up a robotics lab and a mechanical workshop from scratch and lead a group of engineers.

Achievements:
- Successfully set up a Robotics Lab and a Mechanical Workshop.
- Built a Gas analyzer for Robot Attachment.
- Successfully built a ROS2-based & SLAM-based four-wheeled autonomous robot named 'Bengalbot'

Engineering Lead, Hardware Team

Bioforge Health Systems Ltd
September 2020 - March 2023 (2 years 6 months)
Responsibilities:
- Research and development of AI-based medical robots.
- Circuit Design, Firmware Development, Research, and overall biomedical product development
- Design analog frontend & PCB for medical devices, Code Review, Scientific Paper Writing
- Develop strategies to support teams in achieving targets
- Working with the team cohesively and guiding the team to achieve challenging goals

Achievements:
- **Presented 3 projects**(site.ghf2022.org/global-health-lab-en/) in Geneva Health Forum, Switzerland.
- **Main author** of one poster(Oxysaver) presented at Geneva Health Forum, Switzerland.
- Developed "Vital Sign Monitor's Circuit & Firmware" and "Oxysaver- A biomedical oxygen delivery device capable of saving up to 70% oxygen"
- Developed Hardware "VSM-BRIDGE" & Python Code to achieve Optical Character Recognition capabilities of the commercially available Vital Signs Monitor, which has been integrated with Bioforge Hospital Management Software (https://www.bioforgehealth.org/icu-vsm-bridge/)
- **Written 2 scientific papers.** One has been published in IEEE Xplore & Other has been submitted.
- Developed "Solar Powered IoT Handwashing Station" in collaboration with world's largest NGO BRAC
- BLE-Based Portable Medical Device Integration with Central App & Server.
- Started & conducted primary research on a ROS2-based Autonomous quadruped robot for medical application.

Founder
CRUX Technologies
Jan 2018 - Present (5 years 11 months)
Achievements:
- I lead the development of 9 Electronics-related mobile applications.
  Link: https://play.google.com/store/apps/developer?id=CRUX
- Developed an open-source turbine-based medical ventilator. A unique servo-based pressure release mechanism has been designed that makes the system around 36 times more efficient than a solenoid-based ventilator. I lead the team as well as fully developed firmware & circuits. **This is an OSHWA-certified open-source project. Scientific Paper: https://doi.org/10.1016/j.ohx.2022.e00350**
- Developed an open-source STEM Kit named "Digital Pocket Trainer Kit -1"
  https://github.com/Nabilphysics/digitalPoRcketKit-1
- Developed GSM Based Security Device. PCB and firmware had been designed using KiCad & C++, respectively. https://github.com/Nabilphysics/GsmSecurityDevice
- Developed Motor Driver Shield with Built-in Bluetooth Arduino Firmware Uploader, which makes Arduino-based robot development is significantly easier.

Co-Founder & Chief Technical Officer
Cybernetics Robo Ltd.
Sep 2018 - Oct 2021 (3 years 1 month)
Responsibilities & Achievements:
- Completely build the company from scratch to provide world-class STEM education.
- STEM Kit development and production (Idea generating, Circuit design, Documentation, etc.)
- Designing curriculum & course material for Robotics & other courses.
- A few courses and products led by me: Kids Electronics Kit, Solar Kit, Robotics & IoT course, Arduino Kit, Sensor Board, Tech Tube. https://cyberneticsrobo.com/

Assistant Professor | Lecturer
Dept. of EEE, Metropolitan University, Bangladesh
Apr 2014 - Oct 2015 | Oct 2015 - Apr 2018 (4 years)
Responsibilities:
- Teaching Electronics, Robotics & Physics.
- Instructor & Founder, Innovation Lab.
- Started and conducted a course "Robotics & Microcontroller" and provided coaching to the Students of the Robotics Team.
Achievement in Research & Development:
- Published 3 research papers & supervised various innovative projects.
Achievement as Robotics Coach:
- Champion in 9 National and international Robotics Competition.
- 1st Runner-Up in 6 National & International Competition.
- 6th place in Techkriti 2016, Multirotor Competition, IIT, Kanpur, India.
  Details: https://nabilbd.com/#success

R&D Engineer (Part-Time)
Oishi Electronics
Mar 2009 - May 2013 (4 years 3 months)
Responsibilities & Impact:
- Product design and development. e.g. LED Moving Display, Remote Fan Controller, LED Clock
- PCB Design, Prototyping, and Firmware development for PIC & Atmega Microcontroller
- Production line development for small-scale production. I increased production speed by approximately 40% by redesigning some product's circuits & changing production techniques.

Other Experience

- **Team Leader, SUST Drone Team.** A UAV project supervised by Dr. Muhammad Zafar Iqbal, Ex-Researcher, Caltech & Bell Communication Research, USA.
- **Teaching Assistant**, Dept. of EEE, Shahjalal University of Science & Technology, July 2013 - April 2014

Education

Master of Science (MS), Physics, 2012 - 2014, **CGPA: 3.65/4.00**

Shahjalal University of Science & Technology, Bangladesh

Thesis:
"*Embedded System for Control and Data Acquisition of NLO experiments*", supervised by Professor Dr. Yasmeen Haque [Ph.D.(USA), Postdoc. University of Washington, USA].

Two devices have been developed to control the laser and rotational stage. I successfully designed and manufactured a laser controller to operate the Modu-laser for Ph.D. and Masters level students. The cost-efficient controller, priced at 30 USD, offers a substantial cost advantage compared to the commercially available RC-1300 controller, which retails at 712 USD. Additionally, the controller features advanced wireless control capabilities and multiple safety features, providing enhanced value and operational efficiency. The measured accuracy for the controller of the laser and rotational stage has been found to be 97% and 95%, respectively. https://github.com/Nabilphysics/thesis

Bachelor of Science (B.Sc.), Physics, 2008 - 2011, **CGPA: 3.48/4.00**

Shahjalal University of Science and Technology, Bangladesh

Higher Secondary Certificate(HSC), Science, 2006 - 2007, **CGPA: 4.90/5.00**

Brindabon Govt College, Habiganj

Secondary School Certificate(SSC), Science, 1997 - 2005, **CGPA: 5.00/5.00**

Habiganj Govt High School

Skills

- Robotics & AI ● Research & Teaching ● Embedded Systems ● UAV ● ROS2 ● Biomedical Engineering
- Underwater Robotics ● Electronics Circuit Design ● PCB Design in KiCad & Altium ● IoT
- Fusion 360 & Onshape for 3D Design ● Python, C++, Java, Dart ● Arduino, STM32, ESP32 ● Basic Flutter, UI/UX - Adobe XD ● Linux ● Docker ● PyTorch ● TensorFlow ● Computer Vision - OpenCV
- STEM Kit Design ● Product Development ● 3D Printing ● MoveIt for Robotic Manipulation

Publications

Google Scholar: https://scholar.google.com/citations?user=OJELR-QAAAAJ

- "Cost-effective and power-efficient portable turbine-based emergency ventilator", HardwareX, Elsevier, https://doi.org/10.1016/j.ohx.2022.e00350
- "Drone ground control station with enhanced safety features", IEEE I2CT, Pune, India.
- "A Cost-Effective Solution for Real-Time Remote Monitoring of Vital Signs in Patients", 14th Inter-National Congress on Image and Signal Processing, Biomedical Engineering & Informatics(CISP-BMEI)
- "Rapidly developable low-cost and power-efficient portable turbine-based emergency ventilator", ICBBE '21: 2021 8th International Conference on Biomedical and Bioinformatics Engineering
- "Low-Cost Wireless Braille Reader", American Academic & Scholarly Research Journal, Vol. 7, No 6, Sept, 2015, ISSN 2162-321X (print), ISSN 2162-3228 (online)
- " Fingerprint Enabled Electronic Voting Machine with Enhanced Security", International Journal of Engineering & Technology, Vol. 5, No 6, June 2015, ISSN 2049-3444
- OxySaver: Highly Conserving Demand Oxygen Delivery System with Increased Throughput (Submitted)

English Proficiency

Duolingo English Test Score: 125, https://certs.duolingo.com/875966eb9425524e9b494169786d3910

Notable Poster & Project Presentation

- "Oxysaver: A High Conservation Demand Oxygen Delivery System with Increased Throughput", Page-70, Geneva Health Forum-2022, https://www.mdpi.com/books/edition/8460-geneva-health-2022-poster-book
- "Vital Sign Monitor", Geneva Health Forum-2022, Switzerland

Honors & Awards

- SUSTCC AWARD-2013 - SUST Career Club, June 2013, Category: Innovation
- "Honorarium Crest", Digital Innovation Fair Habiganj - 2014 by District Administration, Bangladesh Government, 2014, Category: Innovation
- "Janata Bank Gold Medal", Outstanding Result in SSC Examination - 2005
- "National Science Fair Award-2001", 1st Runner-up, National Level, Bangladesh Government

Volunteering Activities

- Cultural Secretary, Physics Society, Shahjalal University of Science and Technology.
- Producing and Distributing Face Shields During COVID-19.
- Volunteer Work at Local NGO CRUD's Medical Camps.

Notable Projects

- **ROS2 and NAV2-based Autonomous Poultry Robot**

- While I was working as a lead robotics engineer in a start-up company named Bengal Champ, I designed and built a prototype four-wheeled robot, a racking mechanism attached, to work autonomously in a boiler farm resulting in more bird movement and reduction of ammonia gas deposition. ROS2 and NAV2-based SLAM had been used for autonomous operation. Also, I built a gas monitor to be able to monitor air quality and ammonia in poultry farms. Later, the company shifted its focus to building a ROS2-based educational robot, to which I also contributed. My ROS2-related GitHub Repo: https://github.com/Nabilphysics/ros2

- **My Contribution:** Team lead, ROS2-related python code, SLAM-NAV2, Mechanical Design & Building

- **Turbine Based Open Source Portable Medical Ventilator.**

- This is a 3D-printed low-cost portable ventilator controlled via Android Tablet. A unique servo-based pressure release mechanism has been designed that makes the system around 36 times more efficient than solenoid-based systems. This energy-efficient low-noise system can run for 5 to 6 hours at a stretch with its battery. Paper: *https://doi.org/10.1016/j.ohx.2022.e00350*, GitHub: https://github.com/Nabilphysics/ventilator

- **My Contribution:** Team lead & research, writing full C++ firmware, circuit design & making, App UI-UX

- **AI Based ICU VSM-BRIDGE**

- This is a professional product that has been developed in Bioforge Health Systems Ltd, and implemented in hospital. This device can connect any vitals signs monitor to a central station and track patient vitals using Computer Vision for continuous monitoring and scoring. The device can extract data directly from video output so that it does not depend on VSM manufacturer API. Geneva Health Forum accepted this project in 2022. Link: *https://www.bioforgehealth.org/icu-vsm-bridge/*

- **My Contribution:** Computer vision using Python, hardware development using single board computer.

- **Ground Control Station Based UAV**

- Developed UAV: Autonomous High Endurance Quadcopter, Hexacopter, Octocopter, Fixed Wing, Ground Control Station hardware & software. Demonstrated Application: Rescuing person from the water, delivery, weather info collection. Link: https://ieeexplore.ieee.org/document/8226318, Video: https://cutt.ly/k90vzrW

- **My Contribution:** Team Lead & Research, Aerodynamics, Firmware, Communication System, Drone Piloting

- **ROS2 & AI Based Robot for Medical Application(Project still in progress)**

- An advanced robot designed to care for children and the elderly will have the ability to monitor sleep

patterns, detect potential dangers during play and other activities, and provide real-time updates and streaming to parents. Robots will be able to assist elderly individuals in multiple ways, including monitoring daily activities, dispensing medicine, detecting abnormalities, and informing a remote person, among others.
- **My Contribution:** Team Lead, ROS2 coding (Python), Computer Vision, AI Implementation(PyTorch), ML Model Training, Robot Design & Simulation

● **Oxysaver**
   - A novel cost-effective Demand Oxygen Delivery System (DODS) that can reduce oxygen consumption up to 70%, requires only 3% power compared to similar products, reduces refill cost by 67%. It includes a pressure sensor, a normally open solenoid valve, and a processing unit to ensure the supply of oxygen only during patients' inhalation.
- **My Contribution:** Algorithm Design, C++ Firmware Writing, Circuit Design, Device Testing & Documentation

● **Unmanned Underwater Vehicle or ROV**
   - This project involves developing a Raspberry Pi, Arduino, and computer vision-based UUV. The Java-based ground station software allows for remote control of the underwater vehicle and retrieval of sensor data during operation. Video: https://cutt.ly/u90CJig
- **My Contribution:** Project supervision, Research, Firmware, Mechanical Design

● **IoT-Based Vital Signs Monitoring Device**
   - The devices pick up the vital signs of the patient and send them to the nearby bedside unit and also to the hospital cloud servers. Parameters measured include pulse, SPO2, body temperature, ECG and also patient movement. The wearable component can also detect if the patient has suffered a fall near or away from the bed, and notify healthcare providers. This project was presented in a Healthcare Innovation presentation at Global Health Lab, Geneva Health Forum 2022. Paper: https://ieeexplore.ieee.org/document/9624436
- **My Contribution:** Project Architecture Design, Circuit Design, C++ Firmware Development

● **Wireless Electronic Braille Reader**
   - This low-cost device consists of off-the-shelf servo motor, microcontroller, PVC & pin, which can connect to android app via Bluetooth. In the classroom, the teacher can send data to the braille device so that a visually impaired person can read with ease. Paper: https://cutt.ly/d909taP
- **My Contribution:** Research, Servo Actuator Design, Firmware & Scientific Paper Writing

● **STEM Kit & IoT Course**
   - STEM Kit: Kids Electronics Kit, Digital Pocket Trainer Kit -1, Solar Kit. Course: IoT Long Course, Arduino & Robotics for Kids. Link: https://github.com/Nabilphysics/ESP32_IoT_long_course_crux/wiki
- **My Contribution:** Design the above product from scratch, circuit design, documentation

● **Solar-powered IoT handwashing station**
   - This project, built under the BRAC Social Innovation Lab, aims to develop a handwashing station for resource-constrained areas like the Rohingya Refugee Camps. Some feature includes - Human human-centric design, a Filtration System Integrated, IoT Connectivity for monitoring usage and behavior, and Solar Powered for remote operations. Link: https://www.bioforgehealth.org/hand-wash-station/
- **My Contribution:** IoT Integration, Circuit Design & Firmware Development

Other Projects: https://nabilbd.com/#success and https://github.com/Nabilphysics?tab=repositories