

Statement of Research Interest

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1. Introduction

I have completed my Bachelor of Science in Electrical and Electronic Engineering from Khulna University of Engineering and Technology, Bangladesh. Since my undergraduate studies, I am very keen to conduct research on image processing, signal processing and mostly in power system and microgrid, smart grid systems. My undergraduate thesis was based on remote photoplethysmographic(rPPG) signal processing. In the next sections, I will give an overview of my previous research experience and future research interests.

2. Previous Research

In undergraduate studies, my research was mainly oriented to develop a health monitoring system which would be easy and convenient for the use of general people. So, for undergraduate thesis, I chose to work on remote PPG to fulfill my research goals. Apart from the conventional medical diagnosis system, a facial video based system was developed which was capable of detecting the blood volume changes within the facial skin region. By extracting the color channels (RGB color channels) from the video, three physiological parameters (e.g. heart rate, blood oxygen saturation and blood pressure) were extracted from the video. For that, after selecting the region of interest using K-nearest neighbor classifier, some complex machine learning algorithms such as Independent Component Analysis(ICA), CHROM and also some complex signal processing algorithms were performed on the extracted PPG signal in order to determine the required parameters for health monitoring. The work is then converted to a MATLAB application so that a person just have to upload his facial video of a particular duration and then he/she can monitor his/her health conditions easily and without anyone's help. It may also help to maintain the social isolation for the Covid affected patients in this pandemic situation.

Some future works are also proposed for that work such as:

- To develop that work as an Android application so that it becomes more convenient to use
- To reduce the processing time of the system.
- To add some more parameters to the system so that the system can predict the presence of any long-lasting cardiovascular disease.

My research was published as a conference paper entitled as “A Facial Video based Framework to Estimate Physiological Parameters using Remote Photoplethysmography” in “*2021 First IEEE Conference on Advances in Electrical, Computing, Communications and Sustainable Technologies (ICAECT 2021)*” and received the “Best Paper Award” in that conference.

3. Future Research Interests

Besides my undergraduate research topics, my future research interests include the following topics:

- Analysis of Microgrid and Smart grid systems.
- Use of Machine learning algorithms for Microgrid system control.
- Renewable Energy System.

As the crisis of power generation, transmission and distribution is of a major concern in my country (Bangladesh), I want to contribute to solve the vital issues in this field. Also, the conventional grid systems might be replaced by microgrid and/or smart grid systems in near future. These systems can play a very efficient role in ensuring an efficient and reliable power generation and distribution. Thus, I am very keen to conduct research in these areas. Also, the use of Machine learning algorithms to deal with the complex system of Microgrid is a hot research topic nowadays; I would like to apply my previous knowledge in this topic.

Another topic of my great interest is the use of renewable energy system instead of the environment polluting coal or other conventional energy sources so that a pollution free, eco-friendly autonomous electric power system can be developed.

Finally, I hope that by pursuing M. Tech in Power and Energy systems at the Indian Institute of Kharagpur will greatly help me to achieve my research goals which would benefit both me and the institution.