

Ph. D. Research List

- 1. Nivedita Wagh (Registration date: - NA) (Guide: - Dr. S. D. Agashe)**
- 2. Jaswandi Sawant (Registration date: - 19/3/2018) (Guide: - Dr. U. M. Chaskar)**
Title: Robust control strategies for Autonomous Vehicles in Uncertain Environments: SAE has Identified six levels of driving automation from “no automation” to “full automation”. The purposes of this research work is to study different automation levels and identify the area of improvement where the control algorithms can be revised. Thorough understanding of the dynamics of autonomous vehicles and implement existing control strategies for autonomous vehicles under various environmental conditions and analyse area of improvement. To check feasible solutions for current challenges of ADAS and AEIS with regards to different level of autonomous vehicles. To propose a novel control algorithm, which may overcome some of the issue of autonomous vehicles.
- 3. Sapana Korde (Registration date: - 27/3/2018) (Guide: - Dr. U. M. Chaskar)**
Title: Rapid Detection and Quantification of Adulteration in Cow Milk: Milk adulteration is a global concern and social problem Increased demand, growth in competition in dairy industry and financial gain makes some producers to adulterate the milk. The Sensor or sensor array is proposed in the research topic for rapid quantification of the adulterants Urea and Melamine.
The Electrical Impedance Spectroscopy (EIS) is suggested for detection of urea in milk. Similar sensor developed for urea is also to be tried for melamine as well as mixed adulteration. The sensor data can be analysed with different classification algorithm /techniques so that the adulteration can be correctly quantified.
- 4. Nirlipta Ranjan Mohanty (Registration date: - 22/3/2018) (Guide: - Dr. D. N. Sonawane)**
Title: Learning Based Model Predictive Control: Model predictive control (MPC) is an control strategy that uses the model of the plant to predict the future behaviour. The challenges in implementation of MPC is its computational burden as it solves an online optimization problem at each sample time. Hence it requires a powerful, fast processor with large memory for real time application. One possible way to address this challenge is by using machine learning algorithms. Learning Based Model Predictive Control (LBMPC) is a technique in which the model is updated gradually over time. LBMPC combines features of model predictive control and learning based control to improve performance and provides guarantees about robustness, safety, and convergence. The proposed research is to develop learning-based algorithm and its real time implementation for fast dynamic systems.
- 5. Nishigandha Agham (Registration date: - 27/3/2018) (Guide: - Dr. U. M. Chaskar)**
Title: Development and Analysis of Continuous Cuffless Blood Pressure Measurement System: Blood pressure is one of the important physiological parameters of humans. Its continuous monitoring is an imperative aspect of inspecting hypertension and its consequences like cardiac stroke, kidney failure, dementia. So, the continuous measurement is very much required for blood pressure which cannot be possible with traditional cuff-based devices as they are clumsy, time-consuming and cumbersome. Considering this problem, the aim of this research work is to develop a

new method with the help of a learning approach to measure blood pressure changes continuously without cuff (cuffless), which will help not only cardiac patients or health professionals but also for the regular check-up of individuals.

6. Pramod Ubare (Registration date: - 26/3/2018) (Guide: - Dr. D. N. Sonawane)

Title: Design and Analysis of Advance control strategies for BLDC drive - Application to Electric Vehicles: In modern days the importance of electric vehicle increasing due to emission free mechanism. Reliable robust and fault tolerant drive control is vital part of Electric Vehicle (EV), so research in the advance electric drive challenging. Brush-less DC(BLDC) motor provides the convincing characteristics compared to other machines. BLDC can be the used as traction for EV because of power to weight ratio and efficiency. In this first six months of research more emphasis was on the course work along with basic simulation of BLDC motor, EV Load scenario and motor control structure design. Here in this report the modeling of BLDC motor with validation presented. Then EV load modeling simulated and integrated with BLDC motor model. Open and close loop simulation of total model carried out to understand the control need. Then PID control applied to BLDC motor and respective results shows a ripple into the current which need to improve further with advanced control strategies.

7. Shashikant Rathod (Registration date: - 04/02/2018) (Guide: - Dr. U. M. Chaskar)

Title: Adverse Impact of Addiction and Obesity on Heart Rate Variability- A Computational Study: Heart rate variability (HRV) is a reliable reflection of the many physiological factors modulating the normal rhythm of the heart. They provide a powerful means of observing the interplay between the sympathetic and parasympathetic nervous systems. It shows that the structure generating the signal is not only merely linear but also involves nonlinear contributions. Heart rate (HR) is a non-stationary signal; its variation may contain indicators of current disease or warnings about impending cardiac diseases. The indicators may be present at all times or may occur at random during certain intervals of the day. It is strenuous and time consuming to study and pinpoint abnormalities in voluminous data collected over several hours. Hence, HR variation analysis has become a popular non-invasive tool for assessing the activities of the autonomic nervous system (ANS). Computer-based analytical tools for in-depth study of data over short or long intervals can be very useful in diagnostics. Therefore, the HRV signal parameters, extracted and analysed using computers, are highly useful for prediction of cardiac disorder.

8. Sushant Chaudhari (Registration date: - 22/3/2018) (Guide: - Dr. P. D. Shendge)

Title: Robust Control of Non-linear Systems using Disturbance Estimation: The physical systems are different than their mathematical model because of different practical scenarios that are relaxed while obtaining the model for such systems. It is therefore not assured that the control law designed for the obtained mathematical model will give the desired performance when implemented over physical systems. The field of robust control design has the ability to retain the nominal performance of the system under the change in system parameters and external disturbances. The disturbance estimation techniques attracted many researchers to design the robust control. The objective of the Ph.D. work is to design and implement robust control strategies on different class of systems to improve closed loop performance. The application area of interest is: Control of mismatched systems, automotive control systems such as Active Suspension systems, Anti-lock Braking systems, Active Steering systems.

9. Vijayraj Wanaskar (Registration date: - 22/3/2018) (Guide: - Dr. P. D. Shendge)

Title: Design of antilock braking system using sliding mode control and uncertainty estimation for performance improvement: Antilock braking system (ABS) is used as a safety feature in automobiles. ABS is a nonlinear system with uncertain system parameters, unknown relation between tire-road surface and disturbances. Robust control techniques play an important role in such applications. Sliding mode control (SMC) is one of the popular robust control techniques used for various applications. The SMC control when used with estimation techniques such as disturbance observer, uncertainty disturbance estimation, Two-time scale, etc. gives further improved performance. The aim of the present Ph.D. work is to design ABS controller using such control techniques to improve slip tracking and stability of the vehicle.

10. Vaishali Patne (Registration date: - 22/3/2018) (Guide: - Dr. D. N. Sonawane)

Title: Optimal Co-design of Embedded Model Predictive Controller for Real-time Applications: Many process control systems are inherently nonlinear, it increases computational complexity, and in turn affects the sampling times that can be achieved while implementing Model Predictive Control (MPC). The research proposes to work on nonlinear solver to reduce its computational burden and suggest optimal design using reconfigurable platform to achieve higher sampling rates. The processing speed of MPC can also be accelerated by exploring different techniques of parallelism and pipelining architecture of hardware like Field Programmable Gate Arrays (FPGA).

11. Vrushali B. Wakchaure (Registration date: - 27/3/2018) (Guide: - Dr. U. M. Chaskar)

Title: Design and Analysis of Controller for Uncertain Linear Time Invariant System: Biological Systems are nonlinear and time invariant, it consists of primarily Genetic Network. Gene regulation and Mutation are necessary method in the human body. DNA, RNA and protein are the most elements that cause major diseases in the physical body. The controller can regulate the DNA, RNA and protein. Some hereditary diseases depend on DNA, gene formation. Blood glucose control is additionally vital. If the sugar level in the body varies, it'll cause major diseases. The research proposes to design a controller (Fractional Order Controller) for biological systems like Genetic Network System (DNA), Protein formation and Pancreas. The proposed method will be effectively authenticated by comparing with the existing methods in terms of,

- 1) Blood Glucose concentration
- 2) Enzyme concentration
- 3) Number of molecules

12. Mukesh Ghogare (Registration date: - 30/7/2015) (Guide: - Dr. C. Y. Patil)

Title: Robust Sliding Mode Control for Nonlinear System Combined with State and Disturbance Observer

13. Amita Shinde (Registration date: - 30/7/2015) (Guide: - Dr. C. Y. Patil)

Title: Design of feature descriptor for biomedical image indexing and retrieval:

Medical image data have been expanded rapidly in quantity, content and dimension – due to an enormous increase in the number of diverse clinical exams performed in digital form and to the large range of image modalities available. These medical images are in different formats such as X-ray, ultrasound, computed tomography (CT), magnetic resonance imaging (MRI), mammographic images etc. It is very cumbersome task to handle this huge amount of data by human annotation. The important goal is to organize this large data to allow efficient access, search and retrieval. Hence, it leads to an increased demand for efficient medical image data retrieval and management. In this research study we have designed efficient and effective feature descriptors namely local neighbouring binary pattern, fast discrete curvelet transform based anisotropic feature extraction, directional multiscale feature extraction using contourlet transform, local neighbourhood based wavelet feature descriptor, new efficient hybrid approach using directional decomposition and a novel local directional frequency encoded pattern and a new class of optimized Hermite transform for biomedical image indexing and retrieval.

14. Sudam Adlinge (Registration date: - 04/02/2016) (Guide: - Dr. P. D. Shendge)

Title: Design of Sliding Mode Controller for an Unmanned Sea Surface Vehicle in Defence Application

15. Yashwant Adhav (Registration date: -28/01/16) (Guide: - Prof. C Y Patil)

Title: Real time measurement system for specific gravity of lead acid battery electrolyte: The main aim of the research is design online measurement system for Specific gravity of sulphuric acid of the lead acid Battery. By measuring SG the device display the percentage of battery charged. Real time specific gravity measurement enhance safety, life of battery and detect failure of battery at early stage. SG measurement using hydrometer is offline and lab technique which is manual and not accurate. Space required for sensing the specific gravity in battery is less. The simulation of the design is performed and checked by proteus software. The result shown by proposed instrument are compare with Hydrometer.

16. Santosh Rajgade (Registration date: - 19-08-2014) (Guide: - Dr. P. D. Shendge)

Title: Disturbance Estimation and Rejection Based Robust Control for Uncertain systems.

17. Pauroosh Kaushal (Registration date: - 28/8/2014) (Guide: - Dr.(Mrs) R. P. Mudhalwadkar)

Title: Perception Modeling and Feature Extraction for Artificial Sensor System: Artificial sensor system represents an array of sensor which mimics human sensation, converting complex chemical mixtures of sample into information in electrical signal like resistance, voltage etc. Electronic tongue is the sensor system which complements the gustatory sensing of humans which provides information for qualitative and quantitative analysis of beverages and foods. Feature extraction plays a key role in improving performance of the electronic tongue system. In this direction, an artificial sensor system using voltammetric electronic tongue is developed for collection of taste

information of different type of beverages used in pharmaceutical and food processing industries. The voltammetric electronic tongue is composed of an array of five working electrode along with a counter and a reference electrode. The obtained data is processed using novel feature extraction method. The performance of proposed feature extraction method is evaluated by using classification and regression models. In order to improve functionality of the system, perception model is developed which will provide a human-like functionality to artificial sensor system. Perception modeling provides the user with an interface to the sensor system for indicating the quality of sample in terms of human perception which can be easily understood. This approach would be applied to determine the quality assessment of complex samples which are found more commonly in food and pharmaceutical industry. Thus, it is required to develop an artificial sensor system and implement suitable feature extraction method and perception modeling for indicating the quality of sample.

18. Prashant Bhosale (Registration date: - 28/01/14) (Guide: - Dr. S. D. Agashe)
Title: To Deploy the Frequency Compensation Technique to Measure the Temperature of the Object using Ultrasound Waves

19. Nitin Mane (Registration date: - 28/8/2014) (Guide: - Dr.(Mrs) R. P. Mudhalwadkar)

Title: Design and development of system for detection of ripening index of fruit using impedance spectroscopy: Electrical Impedance of biological tissues changes with the change in tissue anatomy and tissue physiology. Electrical Impedance Spectroscopy (EIS) has been studied to characterize the biological objects like fruits and vegetables for assessing their freshness. In this direction, the EIS studies have been conducted as a non-destructive investigation evaluation method to study the electrical impedance variations in fruit ripening. Electrical impedance spectroscopy with suitable data processing techniques will be used to define ripening index of fruit in terms of impedance parameters. The application of electrical impedance spectroscopy would be an appropriate method to detect ripening index of fruits such as chiku, banana or mango without destructing fruits. The aim of this work is to design and develop the system to measure impedance for characterization of ripening index of fruit in terms of electrical impedance spectra.

20. P S Chaudhari (Registration date: - 13/8/2012) (Guide: - Dr. S. L. Patil)

Title: Torque Ripple Minimization Techniques for Brushless DC Motor Drive for Performance Improvement: The main objective of the work which will be carried out during the PhD course is minimization of torque ripples of Brushless DC Motor Drive and find out the technique for the same which in turn will improve the Performance of complete Drive. This can be achieved through study of various methods/techniques which are available for torque ripples minimization of BLDC motor by carrying out a comprehensive literature survey for effective development and implementation of the control system for the same. To achieve the specified aim and objectives various methodologies and techniques are used. Experimental results will be validated using simulation results.

21. Amruta Deshpande (Registration date: - 14/8/2012) (Guide: - Dr. S. L. Patil)

Title: Development of Optimized Controller for Nonlinear Plants Using Different

Control Strategies: The non-linear systems are challenging to control as the behaviour of the system is unpredictable. The non-renewable energy is an important source for the energy to satisfy the power demand. The maximum utilization of solar energy is essential as it is freely available on earth. The cost of photovoltaic energy is very high compared to conventional energy resources. By implementing the different control strategies one can harvest the non-renewable energy for maximum power and efficiency. The solar photovoltaic system is one of the non-linear plants. The solar power fluctuates with the change in irradiance conditions and temperature conditions. The photovoltaic energy can be maximized by finding the maximum power point of the solar panel. The photovoltaic panel should operate at its maximum power for effective utilization of the panel. The work is focused on the development of the different control strategies for finding the maximum power point of a solar photovoltaic system.

22. Praveen Pol (Registration date: - 14/8/12) (Guide: - Dr. S. L. Patil)

Title: Analysis and design of a gate driver and power converter for improving performance of low power Solar Photo-voltaic electrical energy system

23. Sunil K Patil (Registration date: - 13/8/12) (Guide: - Dr. C. Y. Patil)

Title: Design of wavelet filter bank for feature extraction of retinal images for glaucoma detection and post classifier for classification