Aniket Ravindra Bakore Smart Home Management System Using LabVIEW and Arduino Uno

Smart home is a house that uses information technology to monitor the environment, control the electric appliance and communicates with the outer world. Smart home is a complex technology, at the same time it is developing. Everyone wants to enjoy comfort and ensure security at their homes. Most of the security and automation systems in the market are not flexible and full-fledged. There are three important issues addressed by the automation system. The first issue that is to be overcome is the compatibility with various devices and forthcoming technologies. This issue is overcome by auto updating of the central controlling tool. The second issue is any automation system requires different software for different functions. Smart home management system overcomes this problem by integrating all the function into single software. The third issue is energy management. Energy is efficiently managed by separate controls which are equipped by LabVIEWTM. To make a complete system, a hybrid of security and automation systems is designed. Making this complex system is a good challenge as it requires controlling system to be designed with more caution and user friendliness.

This project's main tool is LabVIEW. The four functions of a system are controlled using LabVIEW and Arduino Uno. Arduino acts as a bridge between the analog circuits and LabVIEW program. The Smart home management system gives users flexibility to control all the systems using LabVIEW from any remote place. The user even gets an option to configure his settings via LabVIEW. Moreover, LabVIEW gives an additional option of sending text messages to user's mobile devices.

Prashant Ashok Bansode Fast Linear Model Predictive Control Using Sparse Quadratic Programming Solver

Model Predictive Control (MPC), is an advanced method of process control widely used in chemical processes and oil reneries. MPC problem can be formulated as a quadratic programming problem (QP) problem. Active set method or Interior-point method (IPM) are two prominent approaches used to solve QP problems. IPM has the ability to solve QP problems with large, sparse matrices efciently. Interior-point methods such as Barrier method and its variants require the Hessian matrix of the objective function to be inverted, which involves computationally complex mathematical operations. This computational complexity increases with the increase in size of the Hessian matrix. Taking this into account, we present a quasi-Newton based Interior-point method (qN-IPM), for minimizing a convex quadratic problem with linear inequality constraints arising in linear MPC, which enables faster convergence of iterates. qN-IP algorithm uses BFGS method to approximate the inverse of Hessian matrix hence inverse of the Hessian need not be computed which saves computational time of finding an inverse. The algorithm generates feasible iterates and computes approximate solutions of the

optimality condition as the value duality gap converges to zero. The approach is demonstrated with simulations by applying MPC to Cessna citation 500 aircraft model. We show that the qN-IPM method efficiently solves the quadratic programming problem within specified sampling period and performs well in tracking reference positions of the controlled outputs. Also we demonstrate the run-time comparison of qN-IPM with various Interior-point methods for randomly generated QP problems and show that qN-IPM is faster than log-barrier method in computing the optimal solution of the QP problem.

Prashant Dhondappa Basargi FPGA Implementation of Linear Model Predictive Control for Closed Loop Control of Intravenous Anesthesia

Model Predictive Control (MPC) is a proven predictive class of control strategy used in the industries. Due to high computational complexity involved in solving optimization algorithm, the applicability of MPC is restricted to slow dynamic process control problems which involve large sample time. Due to its capability to handle constraints explicitly and its superiority for processes with large number of variables, now-a-days, the use of MPC for real time control attracts many researchers and developers. In this dissertation, we propose an active set method based quadratic programming (QP) solver architecture used in linear MPC. The architecture is designed using IEEE single precision floating point data format and tailored for closed loop control of intravenous anesthesia. For implementation, a single input (Propofol infusion rate) single output (Bi-spectral Index (BIS)) model of patient has been considered. As every patient is unique, the controller will have to be robust and should withstand all the disturbances. The delivery of anesthesia is a non-linear process and has hard constraints on both inputs and outputs, thus, the use MPC proves the suitability. The architecture is prototyped using Xilinx Spartan-6 (SP605) FPGA operating at 200 MHz clock. The hardware- in-line (HIL) co-simulation shows the proposed architecture performs well as we intended. The experimental results proves the efficacy of proposed design.

Bishal S Uchil Design and Control of DC to DC Single Ended Forward Converter using FPGA

Most digital systems are equipped with DC–DC converters to supply various levels of voltages to logic devices like CMOS. This is because these high performance CMOS devices are optimized to specific supply voltage ranges. DC–DC converters maintain legal voltage ranges regardless of the load current variation as well as supply voltage drop. DC–DC converters are generally classified into two types, namely: linear voltage regulators and switching voltage regulators, according to the circuit implementation. It is generally known that switching regulators achieve better power efficiency than linear regulators, but linear regulators are much cheaper and produce less noise than switching regulators. For this reason, switching regulators are mostly used for low power or high-current applications, except when low noise or low cost is particularly important.
This project deals with hardware implementation of a power converter which when given an input of 230V AC gives an output voltage of 5V DC and sources a current of 10A. The first step was to understand different types of DC to DC converters available and then select the one which is suitable for

the application of Low Power Embedded Systems. Next step was to design the converter and build a prototype of it, taking into consideration each and every component needed to meet the required specification. Last step was to regulate the output voltage by operating the converter in both open loop and closed loop. Power Converter used is a Single Ended Isolated Forward Converter. The regulation of output voltage is done using FPGA Spartan 3E starter board.
This project gives an understanding of power converters, design and implementation of it, and regulation of output using FPGA which is done by implementing Proportional Control action. It lastly describes the enhancements that can be brought about in the project to improve the efficiency of the converter.

Saukhyada Vilas Deshmukh Local Operator Interface Test Automation Using LabVIEW

Local Operator Interface (LOI) provides an efficient means of communication between human operator and the system. It allows easy access to system data and modifying parameters. Local operator interface testing involves checking the user menu, parameter settings, display test and LOI keyboard test. Testing a LOI unit manually becomes hectic for the tester due to its repetitive nature as well it requires more time. Thus, the concept of LOI Test Automation arises.

Machine Vision is the technology used to provide imaging based automatic testing. The sequence of machine vision operation starts with acquisition of image followed by the role of software that employs different image processing techniques to extract information to decide test status (Pass/Fail). Optical character recognition (OCR) is one of the methods used in machine vision. It translates data from images and converts it into computer language. Potential of OCR systems is enormous as they increase system efficiency. It has transformed tasks that required hours or days to accomplish, to a few seconds. Before OCR is applied, the source is scanned or captured through a camera to convert the page in digital format. The OCR software then processes these scans to differentiate between images and text, and determines characters that are represented in the light and dark areas of the image. IMAQ vision system of LabVIEW captures images and pre-processes them for OCR. The challenge is processing images with varied background to make them suitable for applying OCR. In comparison with Matlab, LabVIEW has the flexibility of parallel processing.

This project focuses on the system developed using LabVIEW to test LOI screen using OCR technique. Test reports are generated using the recognized data.

TAPAN KUMAR DHALSAMANTA Development of Biosensing System for Renal disease Detection using Exhaled Breath Analysis

Certain gases in the breath are known to be indicators of the presence of diseases and clinical conditions. There are a lot of gases present at different concentration in our exhaled breath. Among these gases in exhaled breath ammonia acts as an indicator for renal disease. The ammonia concentration increases (from ppb level to ppm level) when a person suffers from renal disease. These

variations in gases have been identified using different techniques like Laser spectroscopy, conducting polymer nanojunction to detect the disease. Even though these techniques are quite accurate and effective they are very expensive and non portable.

So the idea behind this project is to make a low cost, portable, non invasive system for renal disease detection using exhaled breath analysis. The objective is to design a metal oxide semiconductor (MOS) based pellet sensor system. In the system when exhaled breath is passed through a mouth piece on to the sensor there would be significant change in output voltage. This change is helpful to differentiate a normal person from an infected person. This designed system will be an assistive tool for doctors to detect renal disease by analyzing breath sample before and after hemodialysis.

Hrishikesh P. Gokhale Iris Feature Extraction for the Biometric Applications

Biometrics refers to the identification of humans by their characteristics or traits. Many different aspects of human physiology, chemistry or behavior can be used for biometric authentication. The selection of a particular biometric for use in a specific application involves a weighting of several factors. Various factors can be used when assessing the suitability of any trait for use in biometric authentication. Universality means that every person using a system should possess the trait. Uniqueness means the trait should be sufficiently different for individuals in the relevant population such that they can be distinguished from one another. Permanence relates to the manner in which a trait varies over time. More specifically, a trait with 'good' permanence will be reasonably invariant over time with respect to the specific matching algorithm. Measurability (collectability) relates to the ease of acquisition or measurement of the trait. In addition, acquired data should be in a form that permits subsequent processing and extraction of the relevant feature sets. Performance relates to the accuracy, speed, and robustness of technology used . Acceptability relates to how well individuals in the relevant population accept the technology such that they are willing to have their biometric trait captured and assessed. The iris is protected internal organ whose feature remain constant throughout the life span. Taking into consideration all the above characteristics iris is chosen as biometric feature. Iris feature extraction is the method of biometric identification that uses mathematical pattern recognition techniques on images of the irises of an individual's eyes, whose complex random patterns are unique . The various steps in iris feature extraction like image acquisition, segmentation, Normalization are studied. The feature are extracted using the transforms like DCT,HADAMARD, HAAR, Walsh Transform. The other transform studied are Contourlet Transform.

Ashwini Jayavant Kolar Subcutaneous Vein Detection System for Drug Delivery Assistance

The infrared (IR) imaging techniques are proving to be a great boon to the field of medicine and diagnostics, as they promise to deliver high-end results at low development costs. We propose an experimental prototype, which uses infrared technique to capture vein images of limb-under-test,

process these images, and display them on screen. The image capture needs proper illumination with IR source (850 nm), hence different illumination methods are implemented and compared. The captured image from a customized IR camera needs image processing because the image lacks contrast. For contrast enhancement, Histogram Equalization (HE) and Contrast Limited Adaptive Histogram Equalization algorithms (CLAHE) are implemented and compared using ARM Cortex A8 and Open Source tools. Rigorous experiments have been performed on many subjects. The experimental results prove the feasibility of proposed design. The proposed device is non-invasive and helps the physicians to avoid unnecessary puncturing of limbs while injecting a medicine. The prototype designed is portable, easy to use and safe. The use of open source tools and software make the system low cost. The idea can be further extended to palm vein detection and detection of oxygen saturation.

Sujitkumar B. Makode Design and Implementation of Advanced Process Control Strategies for Spray Dryer

In the development of new processes, the design and operation of the pilot plant often run in parallel with the design of the future commercial plant, and the results from pilot testing programs is the key to optimize the commercial plant performance. It is common in many cases where process technology has been successfully implemented on pilot plants and the savings at the commercial scale resulting from pilot testing significantly outweighs the cost of the pilot plant itself.

For any process flowsheet to scale down into pilot plant the data required to design the industrial unit must be clearly identified and studied. So at initial stage we started with the parametric study of spray dryer process and finalised the P&ID by considering each possible cause of plant failure. The difficulty of this work resides in the various constraints that emerge and which must not be allowed to compromise the representative character of the process. At later stage we have commissioned a spray dryer plant as per design and had product level trials on milk and it is able to reproduce the behaviour of the planned industrial process to the smallest detail: yield, selectivity, product quality etc.

This pilot plant can be operated and different control strategies can be tested from PLC, DCS, Local Console as well as Remote Location over Internet depending upon the position of hard selector switch.

The other objectives of this research work are to provide remote access to plant in various disciplines of Science and Engineering as well as to share costly equipment and resources, which are otherwise available to limited number of users due to constraints on time and geographical distances. This plant under Virtual Labs would cater to students at the undergraduate level, post graduate level as well as to research scholars.

Remotely triggering an experiment in an actual lab and providing others the result of the experiment through the computer interface. This would entail carrying out the actual lab experiment remotely as well as comparing system performance on different control strategies.

Nirlipta Ranjan Mohanty **Wireless Sensor Network Design for Greenhouse Automation**

Greenhouses are usually framed structures covered with transparent material in which crops can be grown under controlled environment. There are some important parameters that should be monitored at a greenhouse in order to achieve good results at the end of the agricultural production. Three of these parameters are temperature, light and humidity. Traditionally data and power wires are distributed along the greenhouses for this purpose which makes the system complex and expensive. This paper presents a wireless sensor network having several sensor nodes with three commercial sensors to measure the above parameters. It consists of a sensor node having three sensors, wireless communication module, folded dipole antenna and sink node having wireless communication module, antenna and provide serial communication with PC. Sensors data are stored in the data base and displayed on PC.To evaluate the network reliability and its ability to detect the microclimate the set up is tested in Indian Greenhouses Pvt.Ltd.'s greenhouse in Talegaon, Maharashtra. Four hours experiment shows that, the network stability is fine, the data is consistent with the real environment, network consumes less power, wide range has achieved between sensor node and sink node and thus wireless sensor networks can meet the requirements in the applications.

Parmar Hardik R. **Design and Development of a wireless Electronic Stethoscope using DSP**

Electronic Stethoscope is used to analyze and record heart & respiratory sounds of a human. Signal conditioning and signal processing are two important steps required to design a system. This dissertation presents a design which largely resembles a traditional acoustic stethoscope but with a digital embedded system to handle filtering and processing of the signal. One module consists of Electret Condenser Microphone output with signal conditioning and the other one consists of digital filter design algorithm. The RF module is used for wireless transmission of the signal. The whole idea is to analyze heart sounds. Experimental results will show noise removal and amplification of sounds and assist physicians in making decisions.

PAUROOSH KAUSHAL **Development of Asthma Detection System using Exhaled Breath Analysis**

Breath testing has existed in medical practice for centuries. The analysis of the breath allows clinicians and researchers to assess different body functions in a convenient and flexible way. The vast majority of constituents in breath sample, suggested as biomarkers are present in trace amounts, making detection a challenging task. Exhaled breath biomarkers have been assessed to understand pathological mechanism and to aid clinical decision making of different diseases including asthma, chronic pulmonary obstructive disease, lung cancer and systemic disease.

The main idea behind this project is to develop a low cost, non-invasive asthma disease detection system based on exhaled breath analysis. The main objective is to collect exhaled breath from patient and exposing it on MOS gas sensor system sensing presence of the disease. The work includes

fabrication of MOS gas sensor and analyzing response of exhaled breath on them. A model is developed to simulate the behavior of pellet sensor in exposure of exhaled breath. Comparison is made between the responses of normal person and asthma patient and conclusion is drawn.

SAGAR DADASAHEB SANAP IRIS SEGMENTATION FOR BIOMETRIC APPLICATION

Reliable personal recognition is critical to many processes. Nowadays, modern societies give higher relevance to systems that contribute to the increase of security and reliability. For this purpose the use of biometric systems has been increasingly encouraged in order to replace or improve traditional security systems. Biometrics is the term used to describe the use of biological, physical or behavioral characteristics such as fingerprints, face, iris, retina, gait, palm-prints and hand geometry etc to identify a person. Iris is commonly accepted as one of the most accurate and reliable biometric traits because it has very high randomness in its texture and variability which makes it distinct. However, for the sake of accuracy, iris recognition systems require subject's cooperation in order to capture images with enough quality for the recognition task. Iris recognition system uses pattern- recognition techniques based on high resolution images of the irises of an individual's eye. Here, person's eye image is captured (Data Acquisition), the iris region is separated from the rest of the eye image (Segmentation), this iris region is processed to allow comparisons with existing database (Normalization), and finally specific features from resulting image are extracted to compare with the database (Feature Extraction).

Iris segmentation is the key step in an efficient and accurate iris recognition system. The accuracy of the segmentation decides the efficiency of the further steps such as normalization, feature extraction and matching. Efficiency and accuracy of iris segmentation is tested using the NIR (Near Infra Red) images from CASIA V.1, CASIA V.3I, UBIRIS (versions 1.0), MMU V.1 and COEP iris image databases.

Vyankatesh Dhananjay Sinhasane To Develop an Electronic Tongue System for Taste Identification

Chemical sensors are widely known analytical instruments. To review the main analytical applications during the last decade multi-sensor systems and devices for liquid analysis are developed. These can be collectively called as 'Electronic Tongue'.

Chemical compounds responsible for taste are detected by human taste receptors, and the array of sensors of electronic instruments detects the same dissolved organic and inorganic compounds. Like human receptors, each sensor has a spectrum of reactions different from the other. The information given by each sensor is complementary and the combination of all sensors' results generates a unique fingerprint. Most of the detection thresholds of sensors are similar to or better than those of human

receptors. Like biological tongue, electronic tongue also works in a liquid media, the sensitivity of the artificial system can be much higher, and its capabilities much wider.

The proposed electronic tongue system includes an array of sensors, a driving circuit, data acquisition system and software interface for taste comparison. The electrolytic conductivity signal is sensed by chemical sensor array. The sensed signals are acquired by data acquisition system. Software interface with LabVIEW is used for data treatment and taste comparison. The proposed electronic tongue system develops a new chemical sensors array that includes four chemical sensors and success in differentiating basic tastes in liquid.

Suhasini Subhash Todkari Iris Feature Extraction for Biometric Applications

Reliable personal recognition is critical to many processes. Nowadays, modern societies give higher relevance to systems that contribute to the increase of security and reliability. For this purpose the use of biometric systems has been increasingly encouraged in order to replace or improve traditional security systems. Biometrics is the term used to describe the use of biological, physical or behavioral characteristics such as fingerprints, face, iris, retina, gait, palm-prints and hand geometry etc to identify a person. Iris is commonly accepted as one of the most accurate and reliable biometric traits because it has very high randomness in its texture and variability which makes it distinct. However, for the sake of accuracy, iris recognition systems require subject's cooperation in order to capture images with enough quality for the recognition task. Iris recognition system uses pattern- recognition techniques based on high resolution images of the irises of an individual's eye. Here, person's eye image is captured (Data Acquisition), the iris region is separated from the rest of the eye image (Segmentation), this iris region is processed to allow comparisons with existing database (Normalization), and finally specific features from resulting image are extracted to compare with the database (Feature Extraction).

Feature Extraction is one of the important parts of the identification system and a lot of emphasis is going on methods of feature extraction. Curvelet transform and Wavelet transform, Gabor filter algorithms are various algorithms proposed for feature extraction in iris recognition. Here we will discuss Curvelet transform approach in detail. In Curvelet Transform approach, normalized iris image is filtered with curvelet filter and encoded the horizontal and vertical coefficient of filtered image as an iris template. Performance evaluation of iris recognition with different iris feature extraction algorithm is done by using the CASIA (versions 1.0, 2.0 and 3.0), UBIRIS (versions 1.0), MMU (versions 1.0 and 2.0), ND 04 05 and our own COEP iris image databases. Results are compared by finding the Equal Error Rate (EER) from the Receiver Operating Characteristic (ROC) curve.