COMPSIG NITT

In This Issue. . .

- **Classification of grown-up facial features mapped from childhood facial features using neural networks:** The motivation of this project comes from an idea to identify a person's facial image from that person's childhood facial image, and vice-versa.
- **Generation of stable gait for a quadruped robot:** A simple physical model of a quadruped robot was constructed. A gait pattern was modeled and applied to the quadruped robot and the robot was found to walk stably.

Dear friends! COMPSIG NITT is a monthly newsletter to share the research work done in the Pattern recognition and computational intelligence laboratory, Department of Electronics and Communication Engineering, National Institute of Technology Trichy.

Concepts, Ideas pertaining to Computational intelligence, Pattern recognition and Signal processing are also included in this newsletter.

We expect the feedback, comments and articles from you all.
Issue 2-6: June 2016

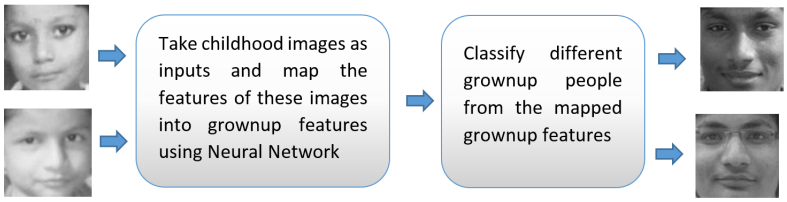
Team members

1. **Dr.E.S.Gopi,Co-ordinator**
2. **G.JayaBrindha, Ph.D. Scholar.**
3. **M.Neema, Ph.D. Scholar.**
4. **Samuel Cherukutty Cheruvathur, M.Tech, Communication systems.**
5. **Kshitij H. Rachchh, M.Tech, Communication systems.**

CLASSIFICATION OF GROWN-UP FACIAL FEATURES MAPPED FROM CHILDHOOD FACIAL FEATURES USING NEURAL NETWORKS

Face recognition is a traditional problem in the image processing and pattern recognition field. Using all the current facial recognition techniques, nowadays some popular softwares are able to identify a person's face from the available dataset. In a software like Picasa, once we mention the name of a person in one image, it automatically identifies that particular face in all other images available in the database.

The success rate of this feature is so high that it becomes a very popular feature in the market. But this software, or any other currently available technique fails to identify a subject's face if the age-difference between the two images is high. That means if any childhood face is given to Picasa, and whole available dataset consists of only grownup faces of that particular person, it can't identify that particular person from the given childhood face image, and vice-versa. This limits the success rate of the face recognition techniques used in these softwares. The block diagram of the project is as shown below.



The motivation of this project comes from the benefit of identifying an adult's facial image from that person's childhood facial image, and vice-versa. This can be useful in all the facial identification environment, i.e. professional softwares like Picasa, social networking sites like Facebook, GooglePlus, government based unique identification database collection like Aadhar Card in India.

By implementing this, people from different age-groups can be identified from images captured in different points of time. For this, first of all mapping from childhood data into grown-up data is required. This can be achieved by using the neural network. Then, it will be necessary to classify those mapped grown-up data into different classes. This can be achieved by any of the conventional classifiers or we can use neural network as a classifier.

For further discussions contact: Mr. Kshitij K. Rachchh, M.Tech, Communication Systems. Mail Id: rachchhk@yahoo.com

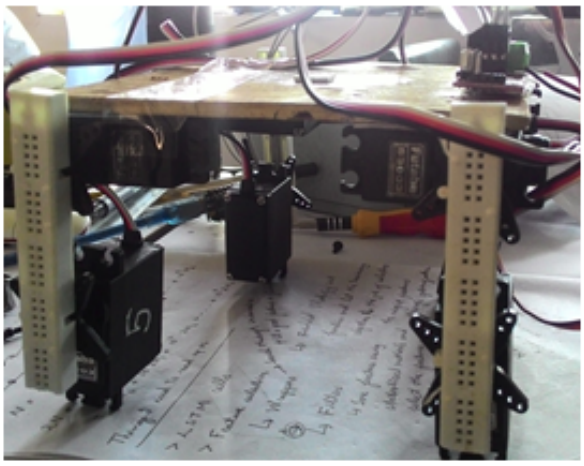
Back to Contents

GENERATION OF STABLE GAIT FOR A QUADRUPED ROBOT

The project on generating a stable gait for a quadruped robot was done by Ashwin Narayan, B.Tech ECE as a part of his final year project. The project focused on three things:

- Developing a Kinematic Model of the robot.
- Developing stability conditions and a stable gait pattern.
- Develop a system for estimating the state of the robot using a minimal amount of sensors.

The kinematic model of the robot was developed in Mathematica and the center of mass (COM) of the robot was obtained as a function of the eight joint angles of the robot. For a rigid body to remain stable, it's COM must remain above the support polygon. Using this idea and COM function, an expression was derived that predicts whether a particular configuration of the 8 joint angles of the robot is stable or not.



To simplify the generation of the gait pattern, 3 assumptions were made about the nature of the gait pattern. Only one of the quadruped's four legs is in motion at any time, the robot is stable at all times and the body of the quadruped maintains a constant distance from the ground. Using these constraints and the equations of the inverse kinematics of the robot, the trajectory of the angle of each leg that moves the robot body forward while maintaining it at a constant distance from the ground were found.

To estimate the state of the robot, first order discrete dynamics were assumed and the state transition and measurement models of the robot body were found in terms of quaternions. A quaternion based Unscented Kalman Filter was then used for tracking the orientation of the robot.

A simple physical model of the quadruped was constructed. PWM controlled Servo motors were used for actuation and an MPU6050 (a 3-axis accelerometer/gyro) was used for orientation sensing, state estimation and tracking. The gait pattern developed was applied and the robot was found to walk stably.

Link to the video of robot walking:https://youtube video of robot walking
For further details contact:Mr.Ashwin Narayan, ECE final year.
Mail Id:ashwinnarayan1994@gmail.com

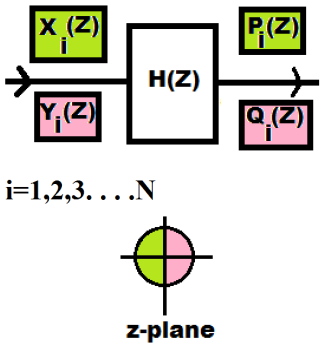
Back to Contents

Quotes

> *"Climbing to the top demands strength, whether it is Mount Everest or to the top of your career."* — Dr. A.P.J.Abdul Kalam

CHALLENGE

Can you think of the method of obtaining the FIR filter with transfer function $H(Z)$ that satisfies the following. (a) $P_i(Z)$ and $Q_i(Z)$ are the outputs in z-domain corresponding to $X_i(Z)$ and $Y_i(Z)$ as the inputs in z-domain for $i = 1, 2 \cdots N$. (b)zeros of $P_i(Z)$ should lie in the right side of the imaginary axis. (c)zeros of $Q_i(Z)$ should lie in the left side of the imaginary axis.



Back to Contents

Feedback

COMPSIG NITT invites articles and innovative ideas from readers for the Reader's Space column. We expect feedback, comments and the articles to monthly newsletter COMPSIG NITT . A facebook group, "COMPSIGNITT" is created for the readers to share their views. Those who are interested can send requests to the facebook group.

Back to Contents

Contact Information:
Pattern Recognition and Computational Intelligence Laboratory,
Department of Electronics and Communication Engineering,
National Institute of Technology
Trichy - 620015
E-mail:esgopi@nitt.edu