EE322: Embedded Systems Design - Project

Elevator system

project proposal

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Introduction

Usually an elevator system means a vertical elevator which was designed to move up and down goods and people. But an elevator can be a 3D one which was designed to move up, down and right, left. In this project we were planning to design and build a prototype of a horizontal elevator like system cable car system in a city. Which mainly move along horizontal direction. This cable car network can be called the third dimension of urban mobility. For this project we have planned to implement a small prototype of a portion of the actual cable car system. In addition to that automatic billing system will be introduced according to the travelled distance by the cable car.

Problem Identification

Traffic congestion is a common topic in present day Sri Lanka. This has gravely affected day to day movements and lifestyles of commuters and residents. Distorted urbanization, the increase in population, and the increase in the number of vehicles are the 3 biggest factors causing traffic problems in cities. In Colombo, there is more than 2 Million floating population during the day time, and the huge traffic congestion is the main issue they have when they do their day to day work.

Proposed Solution

Urban cable cars are becoming increasingly important in cities as a supplement to conventional means of transport in other countries. But in Sri Lanka we don't use cable cars as other countries. As a solution for the traffic congestion we can easily find a solution through this.

An urban cable car can serve as an inexpensive, quickly realizable and reliable subsystem of transport. The main advantage of this cable car network is that this network is totally independent from the road and railway infrastructure. Cable car networks are environmentally friendly as it does not pollute air like other transport methods.

These cable cars have low operating speed as approximately 30km/h maximum travel speed compared to the other public transport methods, but due to their continuous conveying characteristics there is no waiting time and it has high transport capacity. So, this will be the perfect solution for the people who are waiting in a traffic congestion early in the morning. And also, cable cars have the benefit of giving commuters a ride with a view as it allows people to slide above the city.

Market Analysis

As United Nation reports suggest 68% of the world population will reside in urban areas by 2050. Available land areas will be covered with various developments at that time. So, cable cars will be the best solution for travelling in the urban areas.

The tourism industry will also get a huge benefit as the cable cars offer a panoramic view for the travelers. All sorts of logistical issues are solved by using ropeways. If there are any fears around the safety of these travelling cabins, the standard testing measures of ropeway products from manufacturers can be published. Cable car networks have low investment and operating costs. Urban cable cars operate fully automated and the maintenance requirements are also low.

Lot of people and governments are interested in cable cars as it is environmentally friendly. In the modern world there is a big trend in sustainable development concepts. In situations like these cable cars could be a solution to the urban environment which suffers from pollution.

Implementation (Methodology)

Our project represents a small portion of a cable car network. For driving mechanism stepper motors will be used with the help of strings for linear motion. Using stepper motors the position can be easily controlled when it is compared with a DC motor. There are several stops in the cable car network route. These stops can be constructed with the help of IR sensor modules. For every stop the bill is calculated automatically according to the distance traveled. A buzzer is used to alert the destinations of the stops. For displaying the stops and bill and LCD screen will be used. Push buttons are used to give commands to the system. Due to the many number of sensors and actuators the PIC16F877A PDIP microcontroller is to be used which consist of 40 pins.

These are the features of the microcontroller to be used.

Key features	PIC16F877A
Operating frequency	DC - 20MHz
Flash program memory (14-bit words)	8K
Data memory (bytes)	368
EEPROM data memory (bytes)	256
I/O ports	Ports A, B, C, D, E
Instruction set	35 instructions

Table 1: Key features of PIC16F877A microcontroller

Cost Analysis

Components	Price (Rs.)
PIC16F877A Microcontroller	500.00
IR sensors	110.00 x 3
push button switches	5.00 x 4
LCD (16x2) display	320.00
Stepper motor	350.00
Stepper motor control	
Buzzer	25.00
Resistors and Jumper wires	50.00
Breadboard	100.00
Others (structure, power source, capacitors, oscillators)	100.00
	1795.00

Table 2: Prices of the components used

- The components may be changed and additional components may be used for the implementation.

- The total price could vary due to the other components such as components used for building the structure and power sources used in the project.

Timeline (Gantt chart)

Month	June			July				August			
Week No.	1	2	3	1	2	3	4	1	2	3	4
Register and select a Title											
Upload the proposal											
Progress Report 1											
Progress Report 2											
Progress Report 3											
Analysis and Design											
Simulation											
Hardware implementation											
Final report and Project											