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Title: **GSM BASED CONTROL OF AUTONOMOUS MOBILE AGENTS**

ABSTRACT

The development of a mobile robot exploiting the GSM and GPRS techniques in an existing mobile robot technology network for remote control is an essential part of the study. The prototype robot is a four wheeled mobile robot having built in web camera and LCD screen in order to display images and sensor data. Controlling such a system for a PC may overload the processor. The central control unit is ATMEGA - 16 based microcontroller board. It serves two purposes which are real time control and RS232 serial port expander. In order to connect the robot wirelessly to existing GSM network, GSM module interface is used. Application is developed in BASCOM AVR to manage reception and reply of SMS or MMS as well as webcam.

A mathematical model can be viewed as a mathematical representation of the significant relevant aspects of a physical system. The navigation characteristics of the mobile robots or agents are highly non-linear and other static and dynamic characteristics also contribute to instability of the system. In this work the Lagrange method, is employed to derive the mathematical model and thereby formed the basis for the controller design. There are various methods for mathematical modeling of the like (i) Euler Lagrange, (ii) Kane's model, (iii) Lagrange's method etc. Certain assumptions are made to arrive at a particular model which clearly has a physical relevance to the system under study so that various strategies can be evolved for path planning and dynamic stability of the wheeled mobile agent

The remote control of wheeled mobile robot has been successfully implemented considering DTMF control using GSM communication technology. In the present study five controllers are designed for system state variables cart position and pendulum angle, namely, optimal full sate feedback controller, pre-compensator based controller, controller based on fuzzy logic concept, hybrid fuzzy logic controller and artificial neural network based controller. Their dynamic response plots are drawn and their performance characteristics are compared.

Optimal and pre-compensator based controller are deteriorating system performance both in terms of settling time as well as number of oscillations, for cart position state variable. Optimal and pre-compensator based controller are showing similar pattern in case of pendulum angle system variable as illustrated by figures with deteriorating system performance. The settling time in case of pendulum angle is greatly reduced in case of simple hybrid fuzzy based controller, whereas fuzzy controller and ANN based controller exhibit almost similar characteristics, which are almost comparable to hybrid fuzzy based controller, all of these controllers reveal less oscillatory response.

One of the major advantages of system identification is that it allows the real system to be altered without calculating the dynamical equations and system model the parameters again. The problem of identification is basically an optimization problem and is related to approximation theory system identification in a narrow sense. Another advantage of system identification is that if the process is changed or modified parameters of the real time system the real system to be changed without having to calculate the dynamic equations and model parameters again. System identification is associated with developing models of the actual process in simulation. Results from linear and non-linear system identification are obtained using neural networks.