6.1 Conclusions

After exhaustive study of literature and present technological advances, several prototype systems were developed for remote monitoring using cell phone. Initial systems were based on early cell phone models and later systems were implemented using recent Nokia cell phones. The features of system vary widely depending on the user requirements. The existing facilities in the available cell phone models were probed deeply to facilitate development of systems which utilize features in an optimum manner. Some systems were provided with facility of accepting spoken commands, some with prerecorded audio error messages and some were designed with ultra low cost objectives.

The systems based on early phones like 3315, 3310, etc. require F-Bus protocols. These systems have advantage of very low cost as these models supported only voice call and messaging facilities but require usage of F-Bus protocols which need additional processing for identifying frame ID and other parameters and generating and checking check sum for each frame sent or received.

The systems based on spoken commands are user friendly and specially cater to the needs of illiterate, handicapped and elderly persons. However these systems need more complex processing systems (PC) for handling speech recognition algorithm on user side.

Versatile Remote monitoring systems ensure reliable communication through choice of spoken commands, voice call or SMS leading to greater flexibility to user but are relatively costlier.

Novel miscall based remote monitoring systems are ultra low cost systems with negligible operating cost but are less user friendly and predominantly cater to the needs of rural semiliterate population who face difficulty in sending messages but are conversant with voice calls.

Bluetooth based cell phone remote console application has been developed for conventional embedded system to provide greater flexibility and mobility to the operator.

Low cost home automation system using cell phone was also developed and can be beneficial to large number of users.
A major advantage associated with using this approach is the recycling of used cell phones (quantity in billions) which would have otherwise resulted in environmental hazards by unsafe dumping.

It is believed that just like cell phones have brought great convenience throughout all classes of people, remote monitoring systems using these cell phones can help to carry out control tasks in an easier manner and faults and abnormal conditions can be brought to the notice of users instantaneously enabling people to take corrective measures. This work has tremendous potential to improve quality of life for all sections of population in developing countries.

6.2 Limitations

Systems based on miscall concepts require some training time for user to code their commands. An incorrect code can result in wrong command being executed. However, provision has been made for confirmation of command and so there exists possibility for correction of command code if it is detected immediately. Unfortunately MIDP profile does not support voice call control commands, hence it is not possible to provide user friendly interface. Incorrect sequencing of automated soft key presses can result in unpredictable response. The systems must have in-built mechanism to deal with network failure problem.
CHAPTER 7
FUTURE SCOPE

With the reduction in cost of GPRS services, it will be possible to provide more interactive and detailed information of parameters using remote monitoring system with cell phone having Internet connection. Similarly more powerful processor based systems will be able to provide more exhaustive data logging for trouble shooting.

Presently, meteorological climate forecasting data is being obtained from sensors like rain gauge, humidity, temperature, wind speed and direction, etc. located in cities and news reports relating future weather conditions are based on this information. It is pragmatic to infer that correct weather forecasting in rural regions can result in drastic improvement in the yield. For example, many farmers carry sowing operation based on news reports which carry information based on sensors in cities and many times they suffer heavy losses due to variations in weather conditions at their place. Micro-weather stations can be installed in each village and actual data relating to each village can be sent through cellular link to meteorological centres where data can be analyzed and more accurate weather conditions information can be relayed to each village through cellular network. Moreover, this information along with images of diseased plants, pests can be procured using cell phones and relayed to agricultural research centres which can process this data and provide guidelines for pest and disease control to the farmers through cellular link.

Similar approach can be taken for rural health care where data base of each person’s health can be collected and stored in nearby city health care centres database and simple low cost cell phone based applications can be developed to acquire physiological signals like heart beats, ECG, respiration rates, etc. through local volunteers and relayed to health care centres which can analyze case records and provide guidance to patients through cellular network and arrange drug delivery and emergency health care.

So there exists immense potential to develop cellular based applications which can bridge the gap between the cities and villages and provide latest technological solutions to this hardworking rural population and result in true progress of the nation.