

White Paper: Emergency detection in senior citizen communities

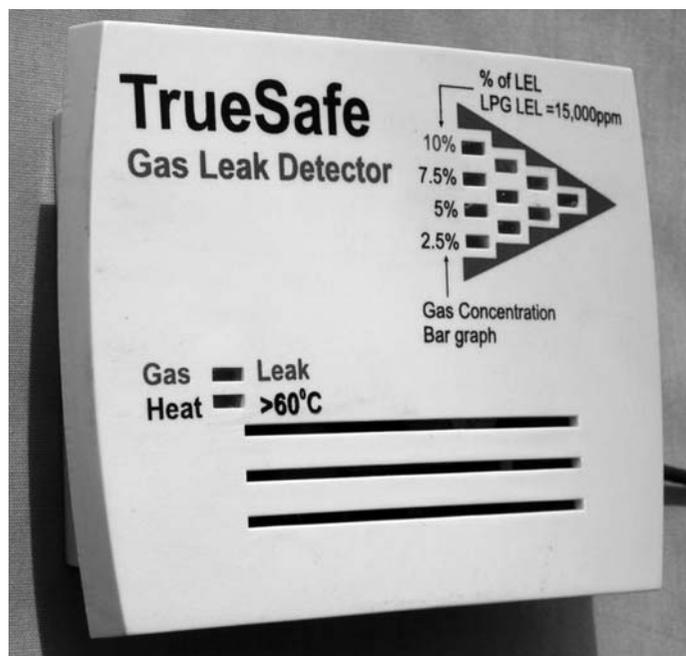
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Abstract: Community living is becoming increasingly popular between Senior Citizens. One of the greatest advantages such homes can offer to senior citizens is safety & Security solutions tailor-made for their day-to-day habits. It is quite important to consider various safety-security related problems faced by them while designing such community complexes. Few solutions could be immediately put to use by using modern technologies like smart sensors, wired / wireless communication, motion detection etc. Understanding these higher end technologies and building real-life engineering application is a designer's challenge, which comes to the rescue of users if it is an economically viable solution. An effort is made to identify some of the un-addressed safety issues. Possible solutions are also discussed.

Keywords: Senior Citizen Safety & Security, Security Systems, Wireless Security Solution, Motion Detection, Body Activity Detector, ECG monitoring, Inactivity sensing etc.

1. Introduction

The modern technology has made every person independent. Natural tendency is towards nucleolus families. Ten years back, Senior Citizens wanted to stay with their children and which was becoming increasingly difficult. However now they prefer to stay independently as their life-styles cannot match with their children. In joint families safety & security was taken care by



younger members in the family. In absence of that support it is quite important to provide them support infrastructure. Modern senior citizen homes are looking forward to address all such issues.

Senior citizens stay in separate condominiums in community living projects. They are provided emergency support by different agencies like medical fraternity, security guards, police, fire dept. Etc. It's quite important to identify the emergency and inform to the respective supporting agency. However objective of this paper is just limited to identifying emergencies and sending signals to Central Monitoring Station (CMS) for the further action. The concept of complete system is discussed in separate paper published by the same author.

2. Safety & Security Problems of Senior Citizens

Typically there are three major types of emergencies faced by them:

- 1) Health related emergencies: Heart Attacks, Paralysis strokes, Falling, High fever, Unconsciousness
- 2) Personal Attacks: Mainly human attacks for looting, rivalry, family quarrels etc.
- 3) Fire: Due to LPG leak or while cooking

Apart from this theft of property is also a major problem faced by all citizens (junior or senior), which also needs to be looked at simultaneously.

3. Problem Analysis

I have tried to tabulate the typical emergency incidences and problems faced in identifying the emergency and sending alert signals to supporting agencies.

Falling	Its quite common to fall in bathrooms. The person may become unconscious immediately or cannot move.
Heart Attack	Person suddenly experiences unbearable chest pain & there is no one around.
Paralysis Stroke	Person cannot move. He or she cannot call/shout for help due to speech getting affected.
Physical Attack	Acquaintance can get an entry inside the house and attack for looting or taking revenge. Unknown person can breach the security and attack for looting.
Fire/LPG Leaks	Person's clothing can catch fire while cooking, they may forget to light ON the gas-burner after turning it ON, when LPG may leak.

4. Solution Analysis

Detecting the problem is one of the most important aspects of the solution. If the occurrence of the emergency is not detected in time it may be too late to provide support.

I have tried to list the cause and the possible detection

methods in the following table. There may not be one single solution possible. Also the solutions suggested will need validation, trials for sufficient period.

Falling	<ol style="list-style-type: none"> 1. Panic Switch like cord switch or panic button could be pressed. 2. If the switch is stationary person may not be able to reach the switch so Wireless Panic Switches (Pendants) could be provided. 3. However if the person becomes unconscious above solutions may not work. This calls for developing mechanism to detect prolonged in-activities.
Heart Attack	<ol style="list-style-type: none"> 1. Wired or wireless panic switches would be normally sufficient to raise alert. 2. However massive heart attacks may not give chance to press the panic switch. In such case continuous monitoring of the ECG is the solution.
Paralysis Stroke	<ol style="list-style-type: none"> 1. Person can press the panic button. 2. However in some cases when person cannot press the button, inactivity sensor has to take over and send the signal. 3. Body activity sensor
Physical Attack	<ol style="list-style-type: none"> 1. Panic Switch could be pressed. 2. In case of sudden attacks shock sensors could be used. 3. Body inactivity sensing could be also used.
Fire/LPG Leaks	<ol style="list-style-type: none"> 1. Smoke detectors could be used to detect the fire. 2. LPG detectors to be used to detect LPG leaks.



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5. Practical Solutions

Though many solutions are suggested in above table, each solution may not be possible at this moment.

Here is table of solutions, which are practical today.

Stationary Panic Switches	Stationery panic buttons are developed by us and are available. They could be located at various points inside the flat or various locations in the Senior Citizen Complex.
Wireless Pendant	We have developed wireless pendants, which are shockproof and waterproof. Typically they can work inside a flat or on the same floor. Range is limited to about 30mtrs. We have also developed a technology to cover different areas like temple, gardens, clubhouse, walkways etc. where we shall erect a cell site and pickup emergency signals from Wireless Pendants. However they cannot work beyond the range of a cell site.
Inactivity Sensors	The inactivity in a particular room could be detected. Such sensor could be placed near bathroom or passage. Inactivity for particular period (say 6 hours) could raise an emergency signal. It is possible that detection after 6 hours may be too late to save the life of a person. However it will at least bring it to the notice.
Smoke & LPG Detectors	Both detectors are available with us.
Remote Audio Module (RAM)	This module has built in speaker and microphone. It acts like a speakerphone in case of an emergency. When the call is established with the CMS or other contact, the other side can listen to sounds around RAM. In case of emergency, one can talk to the aggrieved person and give required assurance.

Some other solutions discussed earlier like Body Activity Sensor, Portable ECG sensor are not practical immediately as prototypes are under development.

6. Conclusion

Modern technology needs to be used to detect the emergency conditions in senior citizen homes. Sensors like wireless panic switches, inactivity sensors shall be most effective. Inactivity sensors shall enable the management (of senior citizen condominiums) to detect emergency but may not save life every time. It is very important to continue development of sensors (e.g. body activity, ECG sensors etc.) to increase opportunities of saving human life.

Realty Automation & Security Systems Pvt. Ltd. Manufacturers Emergency Management System for Senior Citizens. It has created mark by installing such systems across India at all major senior citizen projects.

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