Excerpts from the DESAC Patent Application:

FIELD OF THE INVENTION:

The invention relates a device and method used for doorway emergency sensor for mobility-impaired patients. More specifically, it discloses an apparatus, system and method for detecting a potential fall emergency, discriminating false positives and providing context-dependent emergency call responses.

BACKGROUND INFORMATION:

The Doorway Entry-Sentry Auto-Caller ("DESAC") system of devices and methods is designed to solve several issues that are becoming growing problems in various Senior Living Facilities.

There is a growing population in various kinds of Senior Living Facilities that include semi-mobile residents, like those in wheelchairs, who require one or two person-assists in transferring themselves, who also exhibit varying degrees of forgetfulness and/or dementia. The latter symptom is problematic because it is becoming more prevalent, because the resident often does not remember (or wish) to use their Call Button to call for assistance in transferring themselves, and because they may not even remember that they cannot safely transfer themselves without aid.

The DESAC needs to Automatically Call for Help when the resident demonstrates an intention to attempt to transfer themselves; that is, it should "call for help" before help is actually needed.

There have been some attempts to deal with some of these issues by using different sensing techniques. There are problems with most of them that have slowed or prevented their adoption.

With a threshold pressure switch, often the resident is not able to propel their wheelchair over the bump-threshold-switch due to lack of strength, thereby not activating the switch and subsequently the alarm. They may then attempt to exit the wheelchair unaided, even tripping over this sensor-threshold; usually resulting in a fall.

Wheel-chair seat pads create many false alarms eventually resulting in Alarm Fatigue due to patient repositioning in the wheelchair just for some more comfort. Wheel-chair seat pads only indicate a safety issue after the patient has already started transferring (out of the wheelchair). And, wheel-chair seat pads units that do not insert a Call into the Call system are often unnoticed in closed private rooms, rendering them useless and annoying.

Infrared motion detectors also have many false alarms due to sudden light level changes. An aid is unable to prevent a Call for assistance. If motion is stopped no presence is detected because 'changes' are required.

Door strip sensors are generally some form of ferrite antenna. They require the patient to wear a transmitter or transponder, whose performance is significantly degraded or rendered dysfunctional by metal doors, metal-reinforced wood doors, and metal door jams, all common as fire doors in new constructions. A wheelchair-bound resident with dementia may forget to wear the transmitter/transponder, rendering this sensor useless.

Common Call Button products for hospitals or hospices assume that the resident can or will push the button for assistance when needed, including cabled (bedside) buttons, commode-side pull-cords, wristband bracelets and necklace-pendants. Many patients, though, with varying degrees of dementia, are unable to remember to call for assistance, and usually still only remember that they are fully capable of transferring themselves into and out of a (wheel-) chair. Serious injuries, and sometime fatalities, often result from falls that may not have occurred had help arrived in time. The best scenario would be an automatic call for assistance before a transfer is even attempted.

A better system would solve the above problems by having the following features[1]:

- Non-contact sensing (no need to roll a wheelchair up and over a threshold bumper switch)
- Sensing presence in a narrow beam with distance-discrimination instead of any motion in a wide area and long-distance, one that does NOT require continued motion for proper detection.
- Should not require that the resident remember to wear anything that enables proper operation of the sensing system.
- Is not affected by sudden ambient light changes (lights being turned on or off).
- An aid, such as one escorting the wheel-chaired resident into the washroom being watched, can prevent an automatic call from being made into the call system within a reasonable time of being warned visually and audibly.
- The sensor will not continue to send calls for help by continued movement in the area being watched after the initial sensing.
- The sensor can be re-armed manually after the resident has left the room whose doorway is being watched.
- The sensor will automatically re-arm itself (resume 'watching' and reporting entries) after no presence is detected continuously for a set period of time (assumes room has been vacated).
- The sensor will not require the use of a special call system in that it can interface with existing call systems just like any other standard cabled call button.
- The sensor will behave just like any other call button.
- Mechanical normally open 'push-to-close' switch (mechanical relay, for instance)
- Very high insulation resistance (no measurable voltages for safety).
- Have fixed long-duration contact-closure time (10 seconds for instance) so that Call Systems can (with added software, if desired) discern that an automatic call button has made the call versus a usual manual call button (which is rarely pushed continuously for 10 seconds duration).

- Will NOT interfere with the performance of other call buttons in any way, acting as a supplemental device in enhancing fall prevention.
- The sensor will use short-range 2.4GHz ISM radio communications instead of longer range 900MHz (and others) communications to minimize potential interference with existing Call Systems operations.
- The sensor will be able to operate using batteries commonly used already in other wireless devices, like call boxes, to permit lower costs, safety and in-house maintenance.
- The sensing system needs to operate as automatically as possible to minimize the additional tasking on attending care staff members, while providing for manual interventions by them as application and needs dictate.

The DESAC provides advanced notification to aids, attendants, and assistants by automatically calling for help, through an existing facility's call system, before the patient actually attempts to perform a transfer from their wheelchair, to a commode, for example. When the wheel-chaired-resident enters through the doorway being 'watched' by the DESAC, and after a brief delay during which entry is confirmed, the transmitting module places a radio-call to the receiving module, which, in turn, 'pushes' a request for assistance automatically into the facility's call system. The DESAC obviates and circumvents many 'issues' prevalent with other safety-sensing techniques (chair-bed-floor mats-pads, magnetic-contact sensors, infrared-motion detectors, broken-light-beam, et.al), by its unique design and utilized technologies.

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[1] Like a Preliminary Product Design Specification

SUMMARY:

DESAC is an after-market supplemental wireless (battery-operated, non-contact, radio-linked) pair of transmitter-receiver sensing modules designed to significantly enhance the safety of many wheelchair-bound semi-mobile residents prone to falling while transferring without assistance, many with varying degrees of dementia, in Skilled-Care, Nursing, Rehabilitation, CCRC, Assisted-Living, Memory-Care, and other forms of Senior Living Facilities (including private homes). It works as an automatic trigger of a standard hospital CALL button that works with any standard 1/4 inch plug, normally open, Push-to-Close, mechanical-contact (fully isolated, non-electronic) call-box jacks. Functionally, it appears as though the resident physically pushed their bedside, cabled call button for a constant 10 seconds.

Other methods and structures are described in the detailed description below[2]. This summary does not purport to define the invention. The invention is defined by the claims.

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[2] Reference is to the text that follows in the actual Patent Application (not included here) for brevity's sake.