diabetic coma condition in a T1 diabetes patient

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Figure 1: Mobile app activities in swim lanes

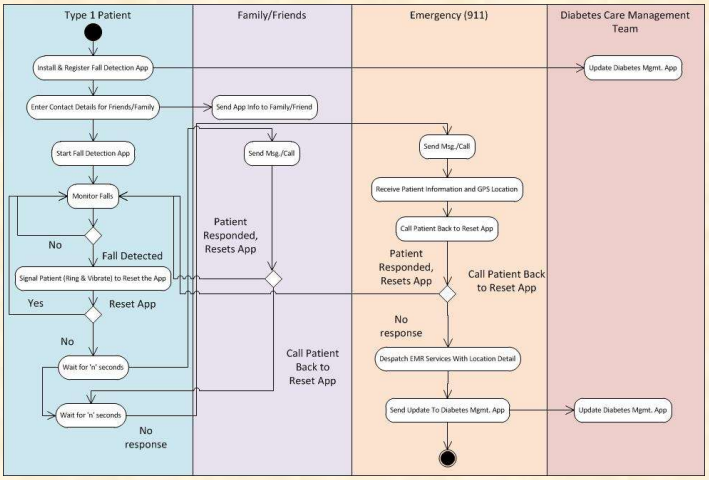


Figure 2: Fall detection algorithm

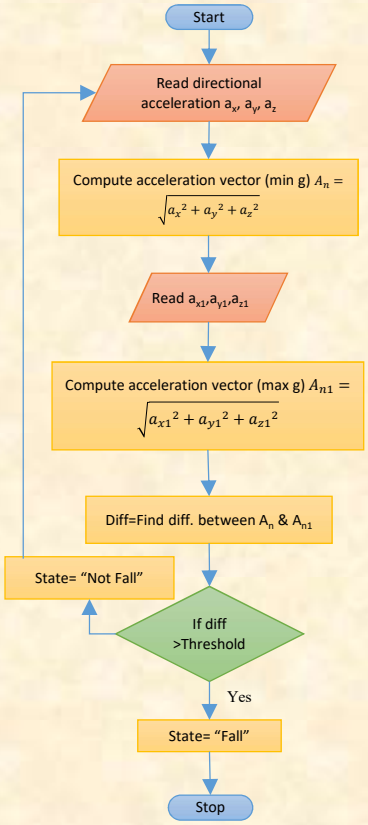


Figure 3: Fall detection using change in acceleration

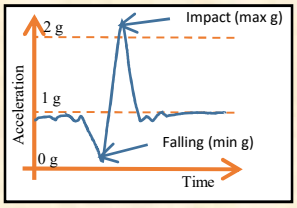


Figure 4: Fall detection testing done on a dummy

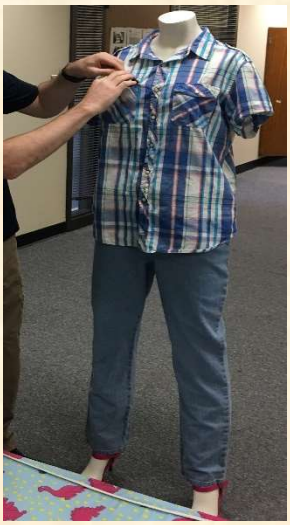
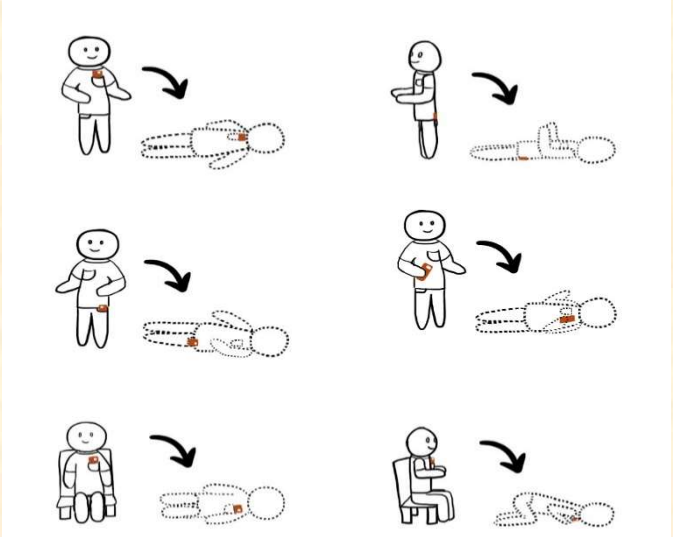


Figure 5: Postures - before and after fall, with smart phone and a test dummy



ABSTRACT

- Type 1 (T1) diabetes costs $14.4 billion in medical costs and lost income in US alone [a].
- This poster explores the application of IT tools, such as mobile devices and wireless connectivity, for effective management of type 1 diabetes [b].
- An automated mobile software application would monitor the patient (falls caused by diabetic coma) and inform the concerned authorities and stakeholders about patients' critical conditions in a progressive manner to avoid false positives.
- The prototype was tested in controlled conditions to calibrate and find the efficiency of the application in differentiating an actual fall to the floor, simulating a diabetic coma condition.

METHODS

Observation –based research method was employed to collect data. A prototype mobile application detected falls using gyroscope and linear accelerometer [c] installed in a smart phone and tested in simulated environment through dummies and volunteers.

The prototype testing collected the accelerometer's readings that fed into the application which eventually classified whether it is a fall or not. The testing also recorded whether the prototype app made the decision to act on the fall and can successfully generate messages/calls in a progressive manner

RESULTS

The prototype was tested against a off-the-shelf app (does not have any algorithm embedded to act progressively) and found that both performed at 94% (*n=18*) while detection falls on dummies (mannequins).

The prototype tested better, 59% vs 35% (*n=17*) when compared to the off-the-shelf app in detecting falls while using a volunteer.

The above tests where conducted on various position using dummies- standing and using a volunteer (face down, face up & side on), on chair (face down & side on).

The reduction in fall detection was attributed to the fact that when using a volunteer did not fall as a dummy would (landing was softened by reflex action, which broke the fall).

CONCLUSIONS

The prototype has promise and potential to be used as a early warning system that can manage the falls caused by diabetic coma condition. The algorithm uses a progressive reaffirmation technique that helps to reduce false positives.

The prototype was tested only from a Type 1 diabetes context, but can easily be extended to any chronic conditions or elderly patients who are prone to falls.

However, there are more variables and parameters that can affect the algorithm's detection capabilities, since Type 1 diabetes patients are mostly children/adolescents/young adults which may affect the accuracy of the fall detection