NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

School of Electrical and Electronic Engineering
College of Engineering

Partnership with
GOVTECH SINGAPORE
SCDF — The Life Saving Force
HOUSING & DEVELOPMENT BOARD

SMART NATION TRANSLATIONAL LAB
Sensor Analytics To Improve Home Fire Alarm Device (HFAD)

Why is there a need?

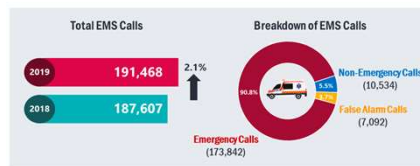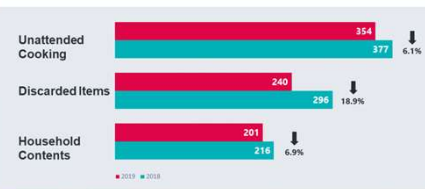EMERGENCY MEDICAL SERVICES (EMS) STATISTICS 2019

Overview

Total EMS Calls
2019 — 191,468 — 2.1% ↑
2018 — 187,607

Breakdown of EMS Calls
90.8% — Non-Emergency Calls (10,534)
5.5% — False Alarm Calls (7,092)
Emergency Calls (173,842)

Chart 1: Top three types of fires in residential premises

Unattended Cooking: 354 (2019), 377 (2018) ↓ 6.1%
Discarded Items: 240 (2019), 296 (2018) ↓ 18.9%
Household Contents: 201 (2019), 216 (2018) ↓ 6.9%
■ 2019 ■ 2018

The installation of HFAD(s) is mandatory for new residential premises, as well as existing residential premises carrying out fire safety works[1], with plans submitted by Qualified Persons to SCDF (or to any other government agencies e.g. BCA, HDB) on or after 1 June 2018.
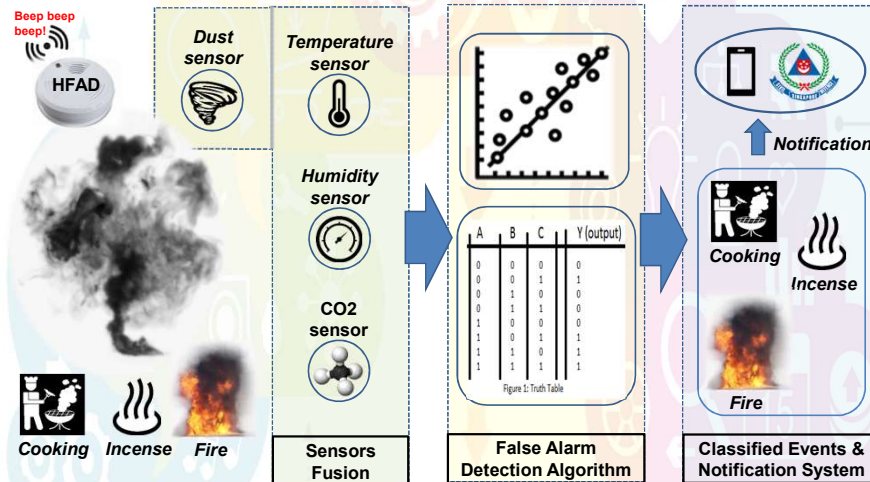
*Information extracted from below:
(1) https://www.scdf.gov.sg/home/fire-safety/home-fire-alarm-device-(hfad)
(2) https://www.scdf.gov.sg/docs/default-source/scdf-library/amb-fire-inspection-statistics/scdf-annual-statistics-2019.pdf

❖ On average, SCDF responded to around 48 non-emergency and false alarm calls daily. These cases still required the deployment of SCDF resources which could have been dispatched to attend to emergency cases which could be life-threatening.

❖ Of the top three types of residential fire, cooking formed the largest component.

❖ In Singapore context, other high probable causes of HFAD alarm trigger would be religious burning, i.e.: incense burning.

How it works

Beep beep beep!
HFAD

Cooking   Incense   Fire

Dust sensor
Temperature sensor
Humidity sensor
CO2 sensor

Sensors Fusion

Figure 1: Truth Table

A	B	C	Y (output)
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

False Alarm Detection Algorithm

Notification

Cooking   Incense   Fire

Classified Events & Notification System

Prototype Deployment

Sensor Node @ praying area
Sensor Node @ kitchen
Sensor Hub @ living room

IoT Dashboard: Visualization (False Alarm Detection / Indoor Monitoring)

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