Child Home Safety

COE 485 Senior project
Final Report

- **Introduction.**

"266,000 accidents took place in the kitchen of a house. "
"over half a million children under the age of five attended A & E last year" from the 23ed annual report of the Home and Leisure Accident Surveillance system UK -1999

     Our project Child Home Safety (CHS) goal is to protect the children from danger and accidents which happen inside the kitchen. By detecting the child when entering the kitchen and perform protection actions in order to ensure the safety of the child.

Spot the Hazards
Can you spot all 12 ?
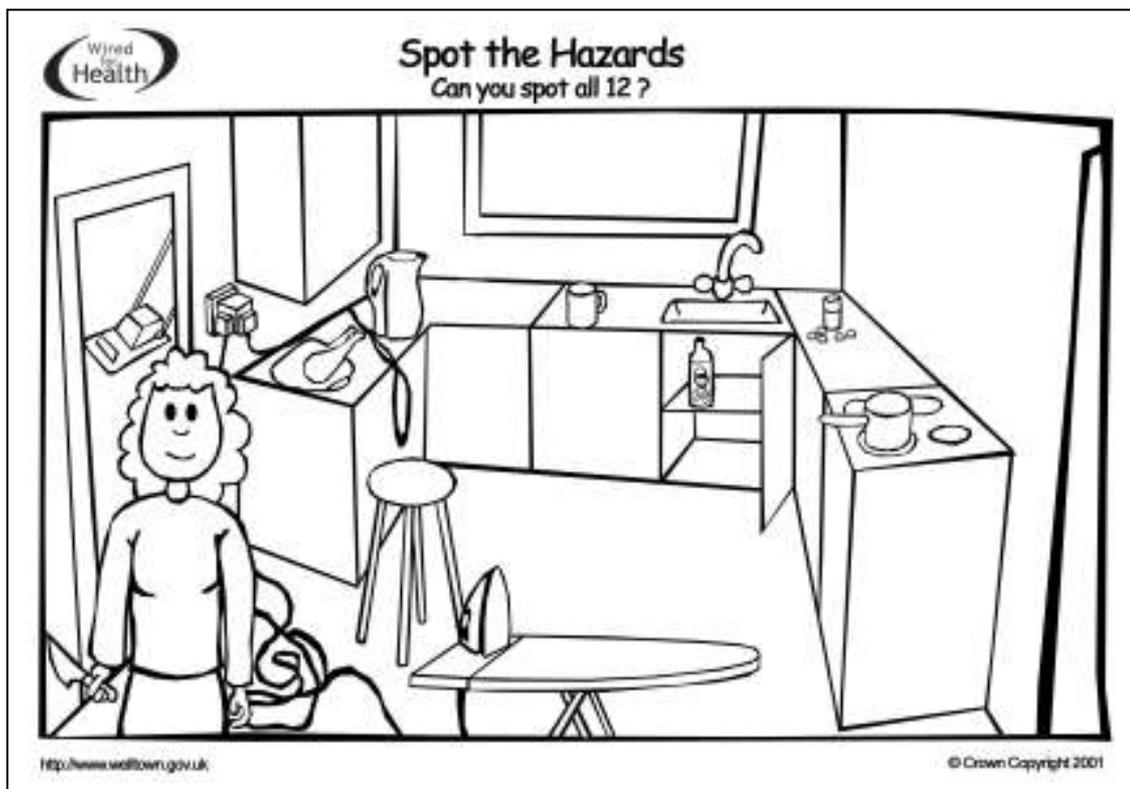
- **Project Selection & Brain Storming.**

    Project was selected after several meetings from the project listed by Dr. Raad which is Child Home Safety. Some major aspect leads us to choose this project is to strengthen our experience in using RFID. And collect all ideas about this project.

- **Market & Hardware Survey.**

    Three meetings occurred to search for hardware which can be applied to the brain storming results. Including some of the following hardware
    1) Electronic Locks.
    2) RFID sensors.
    3) Sound Alarm.
    4) Wireless Camera.
    5) GSM modem.
    6) Solid state relays.
    7) Finger Print recognition
    8) Smart Card.
    9) Infra Red

- **Public Survey.**

    We asked some regular and expert people about their ideas, problems and suggested solutions about the child safety to enlarge our vision in order to find innovative solutions.
    We got a lot of new ideas and areas of research:

    - Lock the door of the oven to prevent the fall of the oven on the child.
    - Sounding a special alarm which will force the child away from a special electronic sound device.
    - Lock all or dangerous kitchen's drawers for child safety.
    - Enlarge the project to include child positioning system.
    - Implement this project for swimming pools.
    - Average height of children under 7 years old.
    - Implement two modes in case of preparing meals you don't want to disable the kitchen

• Devices, Equipments & Tools.

- Skyetek RFID Reader (w/ CD)
- RFID passive tags
- Web camera with video streaming & motion detection (w/ CD)
- TINI microcontroller with Ethernet.
- Java programming language. (old JDK for TINI)
- Solid state Relay
- Cables & Leds.
- A lamp & an oven to represent the kitchen.

(Please Refer to the full documentation on how each part was installed and configured)

• Project Description.

After activating **CHS** in either **Normal Mode or Safe Mode.**
The following actions are described:

1) Detection:

The child is equipped with RFID tag which comes in different shapes & sizes and the door of the kitchen has the RFID reader. So when the child comes near the kitchen door his Tag will be detected and a signal with that detected child Tag ID will be sent from the reader to the PC by Serial connection.

Then, our program in the PC will check the received Tag ID

(1) if it matched with one of the parents Tag ID that means to deactivate the system

(2) If it matched other entries in the stored data base (DB) it will perform the **Warning & Prevention steps (in Normal mode)** or just the **Warning step (in Safe mode).**

(3) If it didn't match any of the registered children then maybe the detected tag belong to another application so ignore it and wait for another tag to detect.

2) Prevention (protection methods):

From our program in the PC a signal will be sent through ethernet to the program inside the microcontroller which will Lock all (or selected) drawers and all or selected kitchen appliances from electricity also turn off the lights (to induce a lost of interest for the child to continue) by changing the signal feeding the solid state relay (SSR) which controls the power of the electric switch board of the kitchen.

3) Warning:

A Web camera is streaming video of the kitchen across the network. Or in motion detection mode it will send an e-mail to the parents. The main program is going play a recorded message through speakers distributed across the house & the kitchen to announce the intrusion of the child and whether the protection methods are going to be executed or not (Normal /Safe mode).

4) Evacuation Plan:

From the our main program in the PC it will play a recorded message to the speakers distributed across the house and Kitchen to instruct the child to get out of the kitchen either by one of the parent's voice or other.

- **Project Name & Group Leader & Logo & Poster Selection**

    The project name was decided to be **Child Home Safety (CHS) .**
    The group leader was chosen to be **Motasim Niazy**.
    Finely, the logo & the poster of the project were designed.

- **Operation Manual**

1) Ensure HW & electrical connection.
- PC & speakers power connection.
- RFID (Serial with PC) & power connection test the reader by Skyetek utility to ensure connection.
- Ethernet Connection between PC & TINI
- TINI power connection (VCC & GND) and **output signals** to SSR & Led.
- Solid State Relay Connection with main power extension and received from TINI.
- Power extension is connected to the power outlet.
- Kitchen appliances are connected with the main electric extension.

2) Ethernet
- IP address configured correctly from the PC & TINI
  Preferred configuration:
  - PC: 192.168.1.2 subnet 255.255.255.252
  - TINI: 192.168.1.1 subnet 255.255.255.252
- Disable any application that use Ethernet if existed ((we faced this problem in RI Lab with an application about authentication with ISA sever)).

3) TINI server application
- Open command prompt (start -> run -> **cmd**)
- **telnet 192.168.1.1**
- (if connection can't be established check 1 & 2 again)
- username> **root**
- password> **tini**
- run the application**: java tcpserver2.tini**
- if you saw the word : **listening……**
  That means the application is working otherwise unplug the power of the AC for the TINI.

4) Web Camera
- Connect the USB connection.
- Open the application VBEE.
- You should see the camera streaming video.
- You can turn the motion detection mode by pressing the electric symbol at the bottom after configuring the SMTP in order to send e-mail for detection.

5) Main program

- Open our application either from the CD or the directory.
- Execute the application
- If it didn't execute the GUI that means the RFID reader wasn't detected so check step 1.
- Be sure that power is ON for kitchen appliances or check steps 1&3)

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       Children DB   manipulation
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- If you want to add another child to the DB you have to enter the name and the TAG ID then press on "Add Child" you will see a pop window confirm the correctness of the process
- If you want to remove a child from the DB you have to enter the name or the TAG ID then press on "Remove Child" you will see a pop window confirm the correctness of the process

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       Activation
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- Press on either "Activate System" which will activate the system in normal mode or "Safe Mode" which will activate the system in safe mode.
- You should hear the audio message indicating the activation of the system if not check the speakers or close & execute the application again.
- You can now pass the RFID Tag of either the parent or the child near the reader and leave it there until you hear the warning & alarm message.
- If it was a parent tag it play a message "System was deactivated…"   or it will play   "Warning…Warning……" And it depends on which mode you have pressed earlier if it was normal mode then you should see that the appliances of the kitchen were disabled or nothing in safe mode.

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       Reset
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- After that you can press the restart button in order to restore the electricity to the kitchen.

- **Conclusion**
  - The RFID used in this project was limited in range (~3 C.M) even with external antenna it can detect only near the antenna. So in order to improve this project we need to use either a more powerful reader or use active tags instead of the current passive tags.

  - In implementing this project in real you will need another Solid state relay so you can handle the power coming from the main switch board of the kitchen.

  - We can see in the market approach in producing each appliance with it's own protection methods which will lead to a rise in the appliance's prices so a more cost for the consumer who have to buy all smart appliances. Instead our project approach a smart kitchen which control any appliances.

- **Task Divided**
  - **Motasim Adil Niazy (Group Leader)**
    ID: 222578, Email: ASOOOOM@gmail.com
    - Schedule Meetings & Action Plan
    - Acquire equipments & Drivers
    - Establish official contact with Dr.Raad & Mr.Malik
    - Web-Camera Installation
    - Presentations & Demonstrations
    - Worked in all HW & SW tasks and established meetings with each side
  - **Ahmad Saleem Aldehlawi   (HW)**
    ID: 222828, Email: Ahmad.aldahlawi@gmail.com
    - TINI MC installation & programming
    - Bread Board & HW connections.
    - TCP server inside TINI
    - Logo Design
    - Kitchen appliances & Speakers.
  - **Kamel Mohammed Ali   (SW)**
    ID: 226736, Email: nawaf009@gmail.com
    - RFID installation & programming
    - SW part Main program:
      GUI & Audio.
    - Poster & logo Design

- **Demonstration**

According to Action Plan demonstration should occur between the 26th May – 2ed June and it was achieved according to plan.

Wed 30th May	Demonstration Preparation
Thu 31st May	First Demonstration to Dr.Raad & Dr.Baroudi
Sat 2nd Jun	Second Demonstration to Mr.Mansoor Al-Dajani
Sun 3rd Jun	Third Demonstraition to Dr.Elrabaa
Mon 4th Jun	Preparation for CCSE party
Tue 5th Jun	Final Demonstration in CCSE party

Regards,
Motasim Niazy (Group Leader)