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RMAIS: RFID-based Medication Adherence Intelligence System

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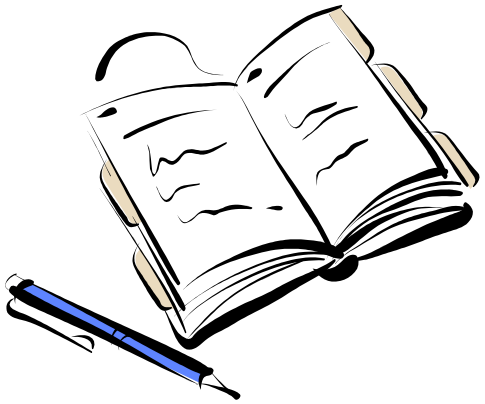
32nd Annual International Conference of the IEEE Engineering in Medicine and Biology Society
IEEE EMBC 2010 1-4 September 2010

Agenda

- Motivation and Problem
- Related Work
- System Architecture and Design
- Our Prototype
- Patient Operation
- Summary

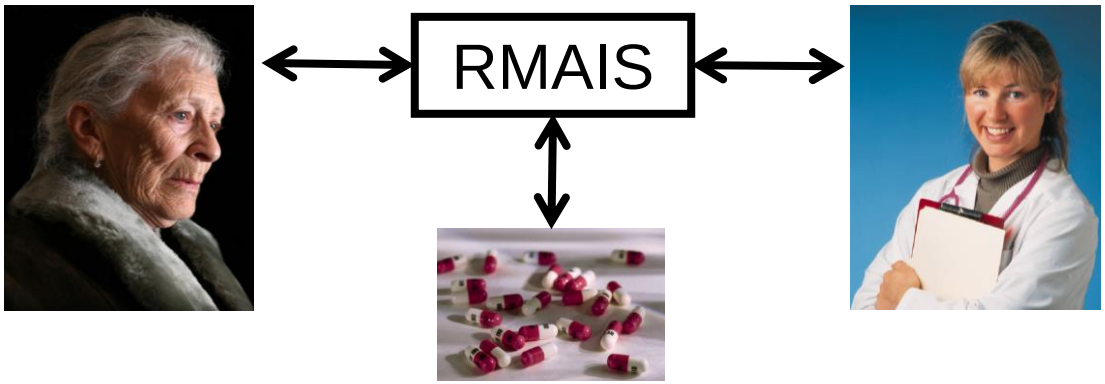


Problem and Motivation

- Medication noncompliance of outpatients is a growing issue.
- Retirement age Americans are predicted to overload the current healthcare system within the next 10 years.
- In-home care is more efficient, but current assistive technologies are either costly or too complicated for elderly patients to use.

Problem and Motivation

- Our goal is to develop a marketable device that implements the following features:
  - *Provide medication reminders to the patient.*
  - *Track medication usage without changing the patient's normal routine.*
  - *Accurately monitor medication intake.*
  - *Assist the patient in choosing the correct medication.*
  - *Notify the caregiver if noncompliance is detected.*



Related Work

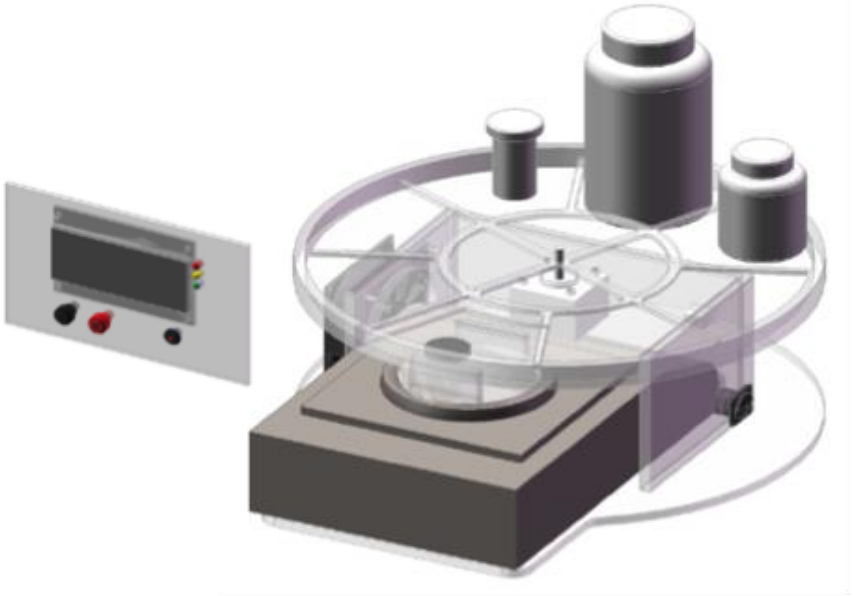
EMMA

- Remotely controlled by doctors
- Dispenses individual dosages for patient
- Format restricted to pills
- Medicine must be packed by manufacturer into special hard paper board.

System Architecture and Design

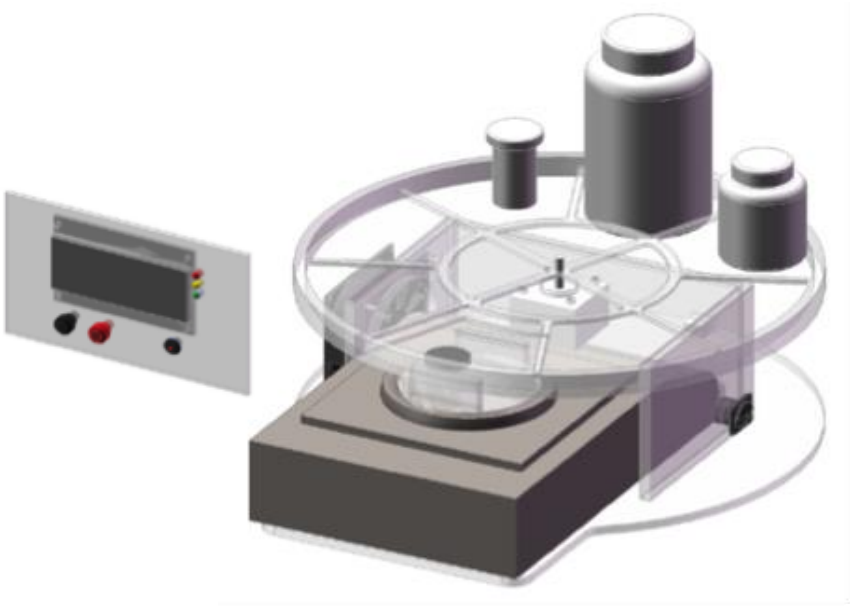
System Components

- RFID Reader
- Scale
- Microcontroller
- LCD Panel
- Rotation Platform

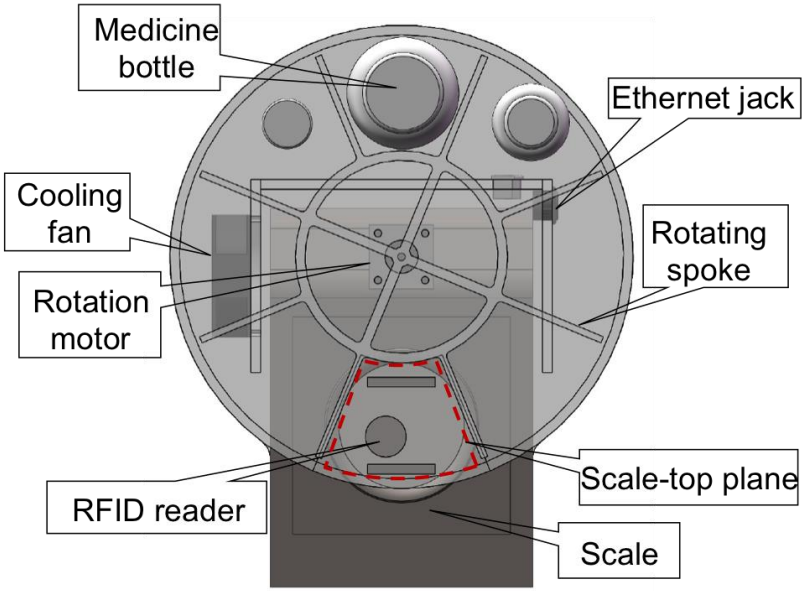


System Architecture and Design

Assembly Model

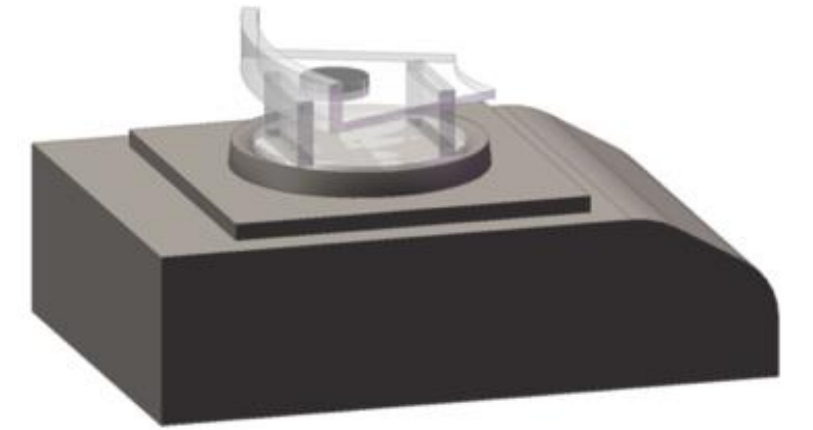


Birds-eye View



System Architecture and Design

Scale-top Plane



RFID Reader

Our Prototype

Patient Operation

- Adding New Medicine:
  - *Patient places medicine on front of platform.*
  - *No other manual input required.*
- Taking Medicine:
  - *Audible alarm activated and text message sent.*
  - *Medicine is automatically rotated to front of platform.*
  - *Display shows dosage instructions.*
- Handling Noncompliance:
  - *Display shows patient that noncompliance was detected.*
  - *Patient's caregiver is alerted via text message.*

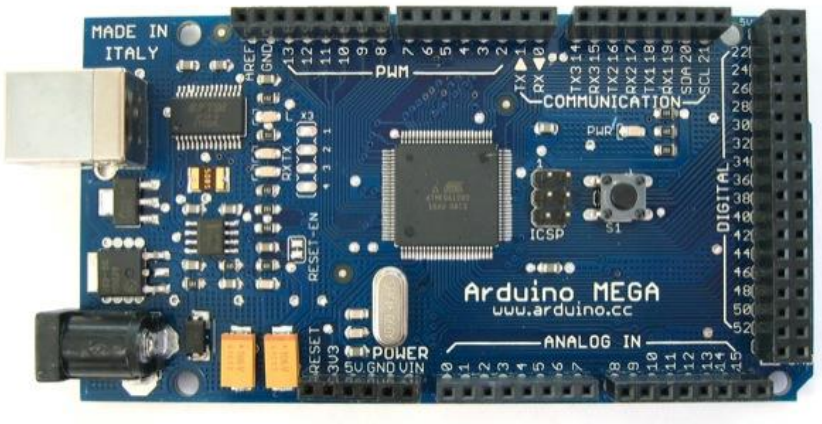
Summary

- Remote monitoring can greatly increase caregiver efficiency.
- Our completed prototype satisfies the project goals.
- The system is user friendly and mostly automatic.
- Our next step is a human trial.

Microcontroller

Arduino Mega

- An open-source prototyping platform based on the Atmel ATMega1280 microcontroller
- 60 I/O ports and 4 UARTs
- 128KB code space
- 4KB EEPROM
- 8KB RAM



RFID Reader

SkyeModule M1-mini

- Integrated antenna with 1-2 inch read range
- Simple TTL interface
- Read and write to HF (13.56 MHz) RFID tags including ISO15693
- TI Tag-it HF-I Standard RFID Tags with 64 bit UID and 256 bit memory