Scientific paper research

# Subjects

* State of the art of pill dispersing
* Medical technology in combination with AI
* Pill dispensing specifics
* (Elderly) technology interaction
* Privacy and ethics of the technology

# State of the art pill dispensing

First I looked into the state of the art of the dispensing part of the automatic pill disperser and investigated two ideas of dispensing the pills.

### The autonomous pill dispenser by Chawla

Some requirements set by Chawla for an automatic pill dispenser are:

* The device should be able to isolate a single pill from a group, regardless of the size and shape of the pills.
* The device should be able to contain multiple types of pills in case the patient takes more than one medication.

To achieve a fulfillment of these requirements a devise with cones were used to isolate the pills and a rotating mechanism was used to ‘dispense’ the pill where is could be obtained by the medicine taker (Chawla, 2016).

### Use for our project

The results of the prototype were promising, and we could use the cone design to dispense the pills in our prototype. (See the source for an extensive description of the design.) This is also the easier version to realize, I think.

## A Smart Pill Dispenser by Casciaro et al

The pill dispenser mechanism is described below

“A slot is divided in two sections, one containing electrical and mechanical components and one containing a flexible belt with teeth molded onto its internal and external surface. The internal teeth allow the belt to rotate around two pulleys, one of which is driven by the stepper motor. The larger external teeth allow to keep the pills. When the belt rotates, the pills move together with it, and when one of them arrives in the lower part of the belt, it falls off the tooth and simultaneously the servomotor opens the inferior lid and drop out the pill through a special opening located at the bottom of the dispenser, from which the patient can take it. Here a contact sensor will detect if the pill was actually taken by the patient (Casciaro et al, 2020)

# Medical technology with AI

A study about reminders for taking medication at fixed times vs at automatically time-shifted based on sensor data, showed that using the adaptive reminders the medication adherence (how fast people take the medication and user friendliness) is higher (Kaushik et al, 2008). However this time-based approach is not always the best as “for example, a reminder is triggered when the user is eating, whereas the medication should be taken after meal” (Wu et al, 2017).

The pillbox system collects real-time sensor data from a smart home environment and analyzes the user's contextual information through a computational abstract argumentation-based activity classifier. Findings - Based on user's different contextual states, the smart pillbox will generate reminders at appropriate time and on appropriate devices.

### Use for our project

In our project the plan is to introduce an AI system that can give reminders/instructions. Using the format given in the paper ‘*AI empowered context-aware smart system for medication adherence’* could give good rules to this AI system.

# References

P. Kaushik, S.S. Intille and K. Larson, "User-adaptive reminders for home-based medical tasks", Methods of Information in Medicine, vol. 47, no. 3, pp. 203-207, 2008.

Q. Wu, Z. Zeng, J. Lin and Y. Chen, "AI empowered context-aware smart system for medication adherence," in International Journal of Crowd Science, vol. 1, no. 2, pp. 102-109, June 2017, doi: 10.1108/IJCS-07-2017-0006

S. Chawla, "The autonomous pill dispenser: Mechanizing the delivery of tablet medication," 2016 IEEE 7th Annual Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON), New York, NY, USA, 2016, pp. 1-4, doi: 10.1109/UEMCON.2016.7777886.(only used for the dispensing part not the remiders/notifications)

S. Casciaro, L. Massa, I. Sergi and L. Patrono, "A Smart Pill Dispenser to support Elderly People in Medication Adherence," 2020 5th International Conference on Smart and Sustainable Technologies (SpliTech), Split, Croatia, 2020, pp. 1-6, doi: 10.23919/SpliTech49282.2020.9243773. (only used for the dispensing part not the remiders/notifications)