# Smart Shoebox
# (Shoes care solution utilizing IoT concept)

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*Abstract*—**This document is about the realization of automatic remote control for shoesthrough IoT. We will make smart shoes cabinet that provides this kind of features with other different kind of functions.**

## I. Introduction

Many people experience difficulty managing their own shoes in a decent and pleasant form. Especially for the people living alone, keeping shoes clean and sweet smelling becomes a tough task to manage. When it rains, shoes get wet and dirty. Can you imagine the smell and feel of the shoe? Even worse the smell starts from the entrance to the place where you will go to sleep. This is when the actual management features are required.

What if someone or something could take care of my shoes periodically and automatically. If the shoes could be managed regularly with the aspects of humidity, temperature, and sterilization, it will save money and also provide a pleasant day with a cozy footwear. To realize the concepts of taking care of our shoes, we will develop a shoebox which manages shoes condition by controlling humidity and temperature automatically and periodically.

We are going to use Arduino to support with humidity and temperature recognition by receiving inputs through switches or sensors. Internet of Things (IoT) is also on the base of the idea. The ability to control things (especially shoes in this case) through internet is the main concept we are trying to realize. We are looking forward to create an integrated service tool such as situation awareness, automatic computing, self-growing.

## II. Requirement

### A. Optimizing environment function

When we wear shoes, they easily become in a state of high temperature and humidity which causes the disgusting smell, which is also the best environment for bacteria to grow. As a result, there is a need to control the condition of the cabinet keeping the shoes. To provide an optimized environment automatically and also on user?s demand is the goal. (There is a need for defining optimized temperature and humidity)

*1) Temperature/Humidity control through electric fan (automatic):* The sensor receives temperature and humidity as inputs and provides an optimized environment as an output.

*2) Temperature/Humidity control through ultraviolet lamp (automatic):* The sensor receives temperature and humidity as inputs and provides an optimized temperature and humidity as output.

*3) Drying feature (on demand):* In case the user's shoes get wet by rain or other liquids the user can request for drying will operate (1), (2).

*4) Sterilization function (on demand):* In case the user feels the need for sterilization, user can request for this function, which operates (1), (2). This function (4) differs from (3) in degrees of intensity.

*5) Deodorization function (on demand):* In case the user feels the need for deodorization, user can request for this function, which triggers a deodorant to shoot out.

*6) Deodorization function (automatic):* The user can set regular intervals to trigger the deodorant to shoot out.

*7) Intensity control feature:* The user can choose the intensity level of (1), (2). Intensity is calculated as number between 1 to 5.

### B. Management function

Different type of shoes requires different type of proper cares. The shoe rack needs to understand and recognize the shoes type and provide a proper management for the shoes. (Modeling : changing ambiguous information into actual concept.)

*1) Shoe categorization function (bar-code scanning):* Shoe categorization through capturing the barcode for the shoes.

*2) Shoe categorization function (user input based):* Shoe categorization through selected category of the user.

*3) Shoe categorization function (captured image):* Shoe categorization through captured images of the shoes.

*4) Shoe categorization function (3D scanning):* Shoe categorization through 3D scanning of the shoes.

*5) Setting the proper management tool:* After Shoe categorization, based on the shoes category, the shoe rack provides the proper setting. (There is a need for defining proper setting for each category) The proper setting is different in the aspect of the intensity from Optimization environment function.

### C. Analysis function

To keep the user?s shoes in high quality we can provide an analysis for the shoes the user own.

*1) Absence of shoes analysis (Base information):* We have decided to analyze the absence of shoes by sensor and use it as a base information for other analysis functions.

*2) Durability analysis:* Durability is set to decrease by the time the shoe has been put on increases.

*3) Life prediction analysis:* Based on the information of (1), we provide the expected life of the shoes.

*4) Preference analysis (personal):* Based on the information of (1) for one user, we provide the preference information of the shoes. More the user put on, more the preference increases.

*5) Preference analysis (general):* Based on the information of (1) for a number of users, we provide the preference information of the shoes for general aspect. Using this Big data, the user can know which shoes are popular nowadays.

*6) Frequency analysis:* Based on the information of (1), we provide the frequency information for the shoes.

*7) Walking habit analysis (health care):* Based on the information flatness of the shoes , we provide the information about walking habit of the users .

### D. Recommendation function

Smart Shoes cabinet will provide recommendation information with percentages based on different kind of aspects. Of course the final choice is up to the user.

*1) Recommendation based on weather forecast :* With weather API, the proper type of shoes is recommended.

*2) Recommendation based on the use of shoes:* Recommending the shoes type which matches with the user?s activity.

*3) Recommendation based on the color of shoes:* Recommending the shoes color which balances with the users clothing color.

*4) Notice of recommendation rate by color:* Showing the recommendation rate by different colors. For example, if the shoes are recommended, a specific color will appear on the shoe rack or on the screen the user is looking at.

*5) Notice of recommendation rate by percentage:* Showing the recommendation rate by percentage. If the shoes are recommended strongly, the percentage will appear on the shoe rack or on the screen the user is looking at.

### E. Notification function

Shoes easily get dirty, since when people do activities, shoes are the first thing that touches the ground. The shoes cabinet will provide notification for contamination of dirt or rainwater by checking on the weight difference.

*1) Recognition of contamination by sensor:* With the increased weight, notification is given for contamination.

*2) Notification for contamination by message:* After the recognition of contamination, the information is notified to the user through messages.

### F. Networking / Remote control function (UI)

Without the function for internet control, it becomes nothing more than a drying machine. With this networking function on the base, the user is able to take care of the users shoes any time, anywhere. This is the most important feature we will concentrate on. Providing the IoT environment is the main goal.

*1) Control function through web programming (main):* With web based program, the user can interact with the smart shoe care software and other provided information.

*2) Control function through mobile (sub):* With mobile application, the user can interact with the smart shoe care software and other provided information.

*3) Control function through embedded system (sub):* With embedded system, the user can interact with the smart shoe care software and other provided information.

## III. CONCLUSION

The conclusion goes here.

## ACKNOWLEDGMENT

## REFERENCES

[1] H. Kopka and P. W. Daly, *A Guide to LaTeX*, 3rd ed. Harlow, England: Addison-Wesley, 1999.