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QR Code Use in Smart Rooms Cleaning Management System

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Abstract:- QR codes or the Quick Response codes are in the initial stage of their evaluation. Currently there are various uses of these codes, but they have a vast future potential. QR codes are basically the newer versions of barcodes. They are very much advanced and efficient as compared to barcodes. Barcodes can only code data from either 0 degree or 180 degree. QR codes can code data from all 360 degree access. Due to this reason, QR codes can store or code around a hundred times data as compared to barcodes. Here, in this paper we explore the use of QR codes as a channel between the physical address and virtual address of a spot or site. How QR codes can act as to ease and better the current cleaning managing systems.

Keywords:- *Inventory Management, Quick Response, Alpha-numeric Data, Information Transfer, Audio Tour*

INTRODUCTION

As coded languages such as Quick Response codes, or commonly known as QR codes are becoming more dominant in fields such as advertising and stock management, its further uses are just leading to start. Its assets and aids are just starting to be noticed. These 2D codes are similar to the barcodes, which were very commonly used before QR codes[4]. They are very much versatile than barcodes. They have much ability to code much more data than barcodes. They are most commonly used on mobile phones, to, for example, initiate a call, visit a website, begin an email, or save any other textual message on the device [1].

QR codes were developed by Denso Wave, for inventory management [3]. They are very useful now-a-days because of their versatility and flexibility. QR codes currently are mostly used as for transferring numeric data, but its use can be expanded. QR codes enable us to design our code information. These codes can allow up to 30 percent loss of data. The QR codes allow us to represent images such as company logos or any other images in form of QR codes.

In this paper, we have implemented QR codes to provide an addressing system for the advancement of currently existing Cleaning management Systems. After brief information on QR codes, in this paper, we will describe the project of our system. In addition, we will discuss future applications and prospects of QR codes.

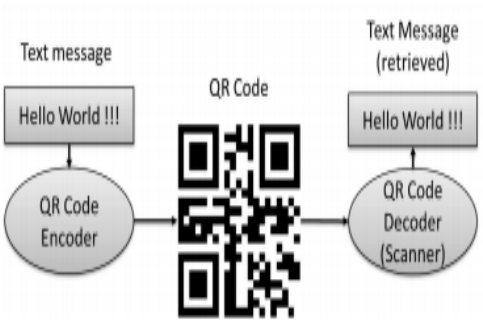

Fig. 1 Working (overview) of QR Code

Figure 1 shows the overview of the working of QR codes. Any plain text, URL, or other data can be encoded in a compact QR code through a QR code generator or QR encoder [2]. Post this, when we need the data of the QR code, QR code can be decoded via QR Code decoder (scanner) which decodes the data of QR code [2].

OTHER QR CODE IMPLEMENTATIONS

Though QR codes have been as inventory management in Japan, these 2D codes haven't been fully realized up to their potential [1]. Early endorsers attempted to find applications that would be effective to be used, especially since devices needed to read codes not owned widely[1]. Cleaning management systems have lagged in implementing the QR codes. A reason may be the lack of knowledge of QR codes. A technological survey in 2015stated that around 78.5% people in India use a mobile phone, but only 17.3% people among them have smart phones(unpublished survey report and [1]). Though there has been a rapid boost in number of smartphone owners, the low acceptance rate of smart phones is clearly a major cause that QR codes are slow to catch on.

Needs of QR codes are varied as the technique they are implemented in. The potential uses are only defined by the creativity of the user or the one attempting to use them. We know that QR codes store alphanumeric data.Thus, their present implementations can be classified into two major types: 1). Information Transfer and 2). Linking to the web and database. *Information Transfer* is the most basic use of these codes as it doesn't involve web access or connectivity on the devices that read these codes— the code will transfer the information themselves without any

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connection required [1]. These type of QR code information transfer includes mobile contact numbers, URLs, home addresses or any contact details on posters. The second type is *Linking to the web*. These type of QR information transfers involve connection to the web, by either Wi-Fi or the device net connection. The transfer of a URL directs to an external webpage, which will require internet connectivity. In this paper, we will further be discussing mostly on *Linking to the web* part[4]. These QR codes can be used for localizing or addressing any area a web address.

- *Information Transfer*

We can see a great example of Information Transfer at the Ryerson University, and the University of Huddersfield. There, the QR codes are currently being used in libraries to save the title, call number, and location of an item to a smart phone [3]. Whenever a patron searched the library catalog, the details page for each item is displayed including the author, title, etc. as well as a QR code is generated which can be scanned to store or save the data or information, necessary for finding the item in the library, to their smart phone. This replaces the need to write down emails, phones, titles, authors, and much information, which eventually saves a lot of time. And eases the work. This can help the users who "*may write down incomplete information from the catalogue screen and become frustrated when they then fail to find the item*" (Walsh, 2010, pg. 6 and [1]).

[Image: An Example of Information Transfer QR Code, representing "BAA57", specific Room ID of one of the rooms we are going to use as an example in this paper.]

Using QR codes for promotional materials is one of the easiest and most effective ways to present the information that can easily be recoded for later use. Now-a-days, every university is using QR codes for promotions of its functions fests and all. Also, most of the functions in any society or clubs or meetings also have QR codes to access their information which they want users to see. Moreover QR codes are a great opportunity to educate users about codes, and excite their curiosity [4].

- *Linking to the Internet*

Another type of Information Transfer through QR codes is Linking to the web. This type of QR code information transfers involve creating a code that transmits the text of a pre-given URL to the scanning device, thus handing over the direct link or access to the online content, eradicating the requirement of manually typing a complicated string of characters. This decoded content can be anything, like a URL, multimedia, or any address of any room or building (in our paper, it is like room number, floor, building number, etc.). No doubt the *linking to the internet* is bit more complicated than *information transfer*, but the potential uses are much greater. Anything or any type of thing or information available on internet can be made easily available through attaching it to a linking to the internet QR codes [2].

[Image: An Example of Linking to The Internet QR Codes, representing URL = "http://cbrcmswa-com.stackstaging.com/docs/scan.php?roomid='BAA57'", specific URL which will change the status of one specific room from clean to unclean. This is for one of the rooms we are going to use as an example in this paper.]

In a smart garbage management system, every 'garbage bin'has its own QR code. Whenever a 'garbage bin' fully fills up, the QR code can be scanned by any QR code scanner app[5]. When scanned, it will decode the URL in it. This URL will redirect to an external webpage which directs to the database on which the cans are managed. Here it will automatically mark the can as full and will send a notification to the administrators that this can is full, or this addressed can need to be emptied. In our paper, we are discussing a similar use of linking to the internet QR codes[5].

Another innovative example of this type can be seen at the Contra Costa County Library. Contra Costa's "Snap & Go Project" uses QR codes to be pasted on vehicles, which linked users or scanners to online audio books[2]. Another similar idea can be seen in First bank. In Denver, First Bank used QR Code Banners to advertise itself at Denver International Airports.

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THE SMART ROOMS' CLEANING MANAGEMENT SYSTEM

Here, in this paper, we are now going to implement our knowledge on QR codes to room cleaning management systems. As we know that currently existing systems for room cleaning management are the manual management systems, where many people are involved in the system. Even then, unclean rooms can be found. Thus, these systems are not efficient.

A. Modules Created

➢ *Administrator's Interface (Rooms):*

The Administrator's Interface for rooms is designed to keep the track of rooms, their roomId(s), clean/unclean status, their QR codes, their blocks, etc. All of their information is stored on the database which can be viewed directly from the Room Admin Interface. The Admin will have the power and authorization to access the site. On the website for admin interface for rooms, the admin can:

- Add a new room to the database
- Update details for any room on the database
- Delete any room from the database
- View and change IDs and QR Codes of any particular room
- Download or Print QR codes for rooms from the website itself

➢ *Administrator's Interface (Workers)*

The Administrator's Interface for workers is similar to the one of rooms. It is designed to keep the track of workers, their worker Id(s), names, password to access the worker interface, contact number, NORC (number of rooms cleaned), etc. All of their information is stored on the database which can be viewed directly from the Worker Admin Interface. On the Workers' Administrator Interface, the Admin can:

- Add a new worker to the database
- Update details for any worker on the database
- Delete any worker from the database
- View and change IDs of any particular worker

➢ *QR code Scanner App for people*

The QR code scanner Interface App for people, is the main interface for our system. It will be a QR code scanner which when recognizes any room ID's QR code, will attach or concatenate the room ID to a predefined string in the site backend itself, which eventually will turn the final result as a URL, which when executed, will result in changing the status of room from 1 to 0, i.e. clean to unclean. So, whenever a person feels that certain room is unclean, he can just scan the QR code, by our app to make the status of room as unclean. As soon as the status of any rooms changes to unclean, we need to trigger the worker's app, to notify him about the unclean room. For this, we will use the Worker's App.

➢ *Worker's App:*

The Worker's App will be installed in every worker's phone, which will directly be connected to the database, for constant check of the details of worker, as well as the rooms he is cleaning, and also the new rooms that he has to clean. As soon as any person scans the QR code by the Scanner's App, and the status of particular room changes from clean to unclean, the worker gets a notification that he has to clean that particular room. The worker to be given notification about the room to be cleaned will be selected by an algorithm, in Admin's Interface. Also, there will be a count, which will track the number of rooms, worker has ever cleaned. Based on this count, workers will be selected. If a worker gets a notification to clean a specific room, it is mandatory for him to clean that room.

CONCLUSION

In this paper we have proposed an advanced and more efficient way for Cleaning Management. In our model, we have implemented QR codes in the smart cleaning management system. Although our project is way better than the existing systems in convenience and efficiency, it also has a few demerits. Still our proposed system will be able to overcome the demerits and gain more features. The main innovative feature that our system serves is that in our system, we are including people, to judge whether a room is clean or not.

- The people who visit the room can decide whether the room needs to be cleaned or not. Only the people visiting have the right to mark any room unclean. For ease of this work, a mobile application was made, which has a pretty simple and easy to understand interface. User just needs to open the app and scan the QR code of the specific room. This room specific QR code will be pasted on the door of the room itself. After scanning, the person will be given an optional form to fill, which includes, his name and number. To maintain the database for people who marked a room unclean.
- After the person scans a QR code, for a room which is unclean, the action triggers the database for the specific room. For that room, the status will immediately change from clean to unclean. That change will be the main action for the room cleaning purpose.
- As soon as the room is marked unclean, the administrators will be notified about the status of the room. When the admin goes to the administrator interface, he will have the list of all unclean rooms. He will then have to allocate the rooms to the workers in a way that workers are given or distributed the work equally. Thus, no worker gets more work than any other. This will be done by a simple algorithm.

- So, when its time to distribute the rooms to be cleaned, the main thing which will decide this will be the NORC count for each worker. Each worker will have his own NORC count., which is Number Of Rooms Cleaned. It will be the number of rooms the specific worker has ever cleaned. Thus, the current one room to be cleaned will be allocated to the worker with the least count of NORC. So, it will not be a repeated work of any one worker. Every worker will have around same number of rooms cleaned.
- Thus, after the allocation part is over, the part comes for worker interface. For workers, an app was made, which is again a very simple and easy to learn interface. There need not be any method to be taught. In the Worker's app, he needs to sign in through the ID, Password given to him by the admins. If he forgets the password or ID, he needs to contact the admins. So, when a specific worker is selected for cleaning a room, he will get a notification in his application, informing him that specific room needs to be cleaned by him.

Our system might have a lot of cons, or demerits, but is already a way better system than the existing systems. This system will get the rooms cleaned more efficiently. As we know that in the existing systems, some rooms need to be cleaned more often than others. So, some workers need to do more work than the others, but still they get paid the same. In our proposed system, this demerit will also be eliminated.

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