

# Concrete Quality Tracking System Outdoor for Smartphones: An Overview

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**ABSTRACT:** Concrete quality is an important parameter for reinforced concrete structures. The concrete quality determined in the construction project must be applied during the production. Therefore, quality control is carried out without spilling the concrete mold. Samples of each cast are taken. These are labeled and sent to the laboratory. The strength of the concrete samples is checked and recorded in a book. But this is a laborious process. In this study, concrete samples tracing were investigated using smartphones. The prepared QR coded labels are affixed on the concrete samples. A smartphone application that recognizes and records the QR code is prepared. The time, location and quality of the concrete samples are easily and accurately determined on this page. In addition, thanks to the records kept by the system, every casting of the concrete was recorded. The construction site engineer, building owner and government officials are easily accessible.

**KEYWORDS:** Concrete, Smartphone, QR Code, Tracking System.

## I. INTRODUCTION

Smartphones have been one of the success stories of the last decade. In a relatively short period of time, smart mobile technology has penetrated significantly into society, capturing an entire age spectrum of subscribers in western industrialised nations, from school children to senior citizens. Such progress has built upon a long history of the use of communication devices, and a rapid adoption of mobile communication devices that began in the latter part of the last century [1].

In large number of mobile application some are pre-installed in phone and others user can download from internet and install it in mobile phone. This large number of mobile application market served by increasing no of mobile application developer, publishers and providers. From the technical point of view the different mobile applications are run able in different managed platforms like iPhone, BlackBerry, Android, Symbian, Windows; also some virtual machine such as Java/J2ME, BREW, Flash Light, Silverlight. According to application area, there are different categories of mobile application [2].

1. Communications: Internet Browsing, email IM client, Social Networking
2. Games: Puzzle/ Strategy, Cards /Casino, Action/ Adventure
3. Multimedia: Graphics /Image viewer, Presentations viewers, Video Players, Audio players
4. Productivity: Calendars, Calculators, Diary, Notepad /Memo/Word Processors, Spreadsheets
5. Travel: City guide, Currency converter, Translators, GPS/Maps, Itineraries / Schedules , Weather
6. Utilities: Profile manager, Idle screen/Screen saver, Address book, Task manager, Call manager, File manager

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Research in mobile computing has mostly been of a “technology push” nature, with a focus on what mobile computing technologies can offer, and investigating solutions to particular industry problems. Examples include the evaluation of IP Telephony technology for construction information communication [1], the implementation of wearable computers on construction sites [4-9], the use of wireless sensors [10-16], and the auto-ID technology that integrates PDAs and bar code scanning together [17-22].

Concrete quality is very important for reinforced concrete structures. The concrete strength is determined during the projecting phase and must be at least at this strength during manufacturing. Concretes used in construction in our time come from concrete blocks ready. Concrete quality is determined by suitable mixture in concrete plants. After the concrete is moved to the site with concrete mixers. Quality control is carried out by taking the samples before casting the concrete into molds. The sampled samples are inspected by sticking labels on them. In this study, concrete samples tracing were investigated using smartphones.

## II. CONCRETE CASTING ON SITE

Concrete quality is very important for reinforced concrete structures. The concrete strength is determined during the projecting phase and must be at least at this strength during manufacturing. Concrete used in construction in our time comes from ready-mixed concrete plants (Fig. 1a). Concrete quality is determined by suitable mixture in concrete plants. After the concrete is moved to the site with concrete mixers (Fig. 1b).



(a)



(b)

**Figure 1: a) Concrete production plant, b) Concrete Transporter**

Quality control is carried out by taking the samples before casting the concrete into molds. The specimens are inspected with stickers attached to them (Fig 2). These labels are manually written and glued onto the concrete. The date and place of sampling on the label. These labels adhered on wet concrete have deteriorated over time. Therefore, the texts above cannot be read later.



**Figure 2: Labeled Specimens**

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Concrete samples taken during casting on site are brought to the laboratory. The samples are kept in curing pools. As the curing pool is a tank full of water, the labels are getting wet and the readings become more difficult. This difficulty comes to the fore when it comes to the label system that can be used later in this work. samples held in water for a period of 3, 7, 28 days after breaking under pressure to perform strength tests (Fig 3). Test results are recorded in the books.



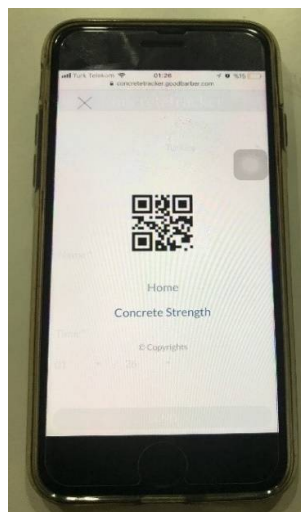
Fig 3: Testing At the Strength of the Samples

## III. SMARTPHONE APPLICATION

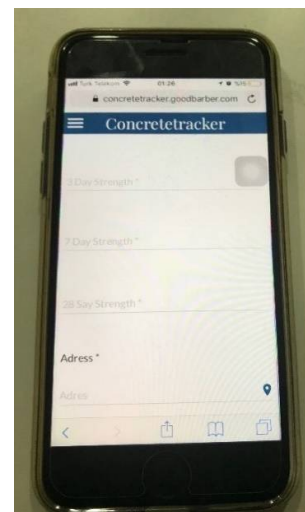
The application can be used with android iOS or any web browser. The technical staff entering the system with the user name paste the QR code label onto the concrete sample and then record the sample by reading the QR code with the 'Scan QR' button in the application (Fig. 4). The system determines the position with GPS. The Internet records the date and time of the sample with the date and time. Afterwards, the results are recorded in the system after the experiments of the samples are made in the laboratory.



(a)



(b)



(c)

Figure 4: Application Photographs

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All e-mail can be sent to the desired e-mail address by e-mail sending option in the application. In this respect the construction site manager, the building owner and the supervision engineers can easily control the concrete quality. System architecture can be seen Fig. 5. All records are kept in the system even in later ages. In this way, the building production process is formed in a way that does not disappear.



Figure 5: Proposed System Architecture

## IV. CONCLUSION

In this study, a mobile application was prepared to follow concrete samples. The application is being used on the construction site by smart phone. With the QR code reader in the application, labels sticking to the samples are read and recorded to the system. With the aid of GPS, the place, time, and casting of the concrete are recorded. Later, the samples taken in the laboratory are again tested by reading the QR code. Tests to be done on 3, 7 or 28 days are easily recorded thanks to the application. This quality control process is performed without error. In addition, recorded data can be accessed at later ages. The type of material prepared in the concrete plants will be added to the system in future development. All the records of the concrete material used in the construction can be followed easily.

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