

Android Application for Enhanced Indoor Health Environments

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Abstract

The main motto of this application is to reduce pollution by increasing the greenery part around us. Air pollution is one of the major problems facing today in almost all age groups of people in society. This pollution is higher in metro cities due to heavy usage of vehicles and other industries etc. As pollution is increasing day-to-day, the number of people being caused or affected by serious lung diseases and other types of serious inhaling problems are also increasing a lot. Nowadays, due to the heavy increase in the number of people in cities, the usage of vehicles and smoking and also other issues, the pollution is increasing a lot. Due to the increase in people number, to accommodate such people, deforestation is one of the major things being implemented by the people in cities. As a result of this, the eco imbalance is increasing a lot. As a result of this deforestation, the major solution giving by most environmentalists is the plantation of trees or plants in homes or in indoors. As we grow the indoor plants, the quantity of oxygen generation being increased and the levels of carbon dioxide may be reduced. In the current article, a mobile-based application has been developed such that to identify the levels of CO₂ in indoor places and suggests the users plant the indoor plants in number such that to reduce the impact of the pollution. Whoever will register in this application can get the data about the level of pollution and advice of how many plants to be placed or grown in their particular indoor places.

Keywords: *IAQ, Android, Pollution, Society, Air, Diseases, City, Villages, Offices, Indoor, Plants, People, Plantation, Oxygen, Carbon dioxide*

1. Introduction

Indoor Air Quality (IAQ) refers to the air quality within and around buildings and structures, especially as it relates to the health and comfort of building occupants. Understanding and controlling common pollutants indoors can help reduce your risk of indoor health concerns. Health effects from indoor air pollutants may be experienced soon after exposure or, possibly, years later. The major concern for the people to stay in the cities or a country is to have good health conditions for the public to live. The major concerns of the public are to live in a city or to carry their day-to-day works are the good environment to stay and good nature and good living conditions [1]. The environment is such that the people can have good temperatures, good air and other related sources. The growing of plants in the cities or towns will increase the good living standards of the towns or cities. Once if the trees are grown, the temperatures will be under control and the people can live in the towns or cities under good range of

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temperatures. Nowadays the governments are planning to plant more number of plants such that to reduce the pollution and also to increase the good environment of living conditions for both the human beings and also the other animals and birds etc. Once the plants are grown in more number, the pollution of the dust that was being generated will be taken by the plants and the fresh air and good rainfall from time to time will be possible. Hence, the growing of the plants and other watering them from time to time will give us a green environment with good air to inhale.

The number of plants in a particular area will give us the detail about the safety of that area for a human being or some animals or some birds to stay in such area or not. The more plants, the more safely for the people or for the animals to stay and carry their life in such areas [2]. Hence, there is a need for the plantation and maintenance of the plants by regular watering. Also, the researchers and the other people are looking for other sources of technologies and other devices that provide a good air to the people who were living in the cities. In the current article, an attempt has been made to give a solution to the other alternative measure for providing good and hygienic air for the public in the society. In the current article, an attempt has been made to check the quality of the air in rooms and halls indoor and outdoor.

Some of the various important issues or the points to be monitored while checking the quality of the air in a particular room. Those points are the population growth or the day-to-day increase of the population in the cities. As the number of people in a city is increasing day-to-day, the inhalation of the air also might go more and more and also the pollution in the city also increase as a result of this, the quality of the air will be thinned. Hence, as a result, the population cannot have good air for their body so many problems of inhalation might attack the public in the society. The other issue is the population in terms of marine. The presence of marine pollution might cause serious issues that may cause serious health issues to the public [3]. As a result, the public must always try to reduce the marine population.

The other important issues or points to be considered are the presence of fossil fuels in society and change in the climate. The usage of vehicles in the city also might increase the pollution due to the release of fossil fuels. Carbon monoxide is one of the dangerous chemicals that will come out of any vehicle fuel burnings. The utility of the vehicles in society also should be reduced such that to maintain good air in the society. In the same way, climate change also will result in various drastic situations like a sudden change in temperatures and also for sudden cyclones. As a result of such sudden cyclones, the damage of the properties and damage to the human lives also more. To create thermally comfortable environments, decent air quality ventilation can be used. The IAQ system aims to ensure independently and accurately monitoring, simultaneously the indoor air quality in different rooms of a building. It consists of monitoring air quality using wireless communication [4]. The system collects five environmental parameters (air temperature, humidity, carbon monoxide, carbon dioxide and luminosity) from different locations simultaneously. Other sensors can be added to monitor specific pollutants.

The environment is such that the people can have good temperatures, good air and other related sources. The growing of plants in the cities or towns will increase the good living standards of the towns or cities [5][6]. Once if the trees are grown, the temperatures will be under control and the people can live in the towns or cities under a good range of temperatures. Nowadays the governments are planning to plant more number of plants such that to reduce the pollution and also to increase the good environment of living conditions for both the human beings and also the other animals and birds etc. [7]. Once the plants are grown in more number, the pollution or the dust that was being generated will be taken by the plants and the fresh air and good rainfall from time to time will be possible.

1.1. Immediate effects

The problems that will arise due to the pollution of the air surrounded by us will be in two types. The short form of effects and long form of effects. The short form of effects is those with which those diseases or problems can be reduced by taking or following simple measures. These problems also can be avoided if we follow some serious and preventive measures earlier than the problems arise. Most of the symptoms that can be observed due to these types of problems are the burning of eyes and increasing the boringness slowly day by day and irritation in the eyes, nose mouth, throat, headache, etc. If any of these problems or symptoms were being observed immediately you need to identify that your surroundings are being polluted and you need to take preventive measures such that to avoid serious problems from then onwards.

1.2. Long-term effects

The other types of health issues are the long term effects. These effects might affect the major parts of the human body like heart problems, respiratory problems, etc. Once these problems are observed in any person, immediately he has to be admitted to hospital such that to start the treatment immediately and he should be kept in a cool and clean place such that the further increase of the diseases can be controlled and in some in cases it should be stopped seriously.

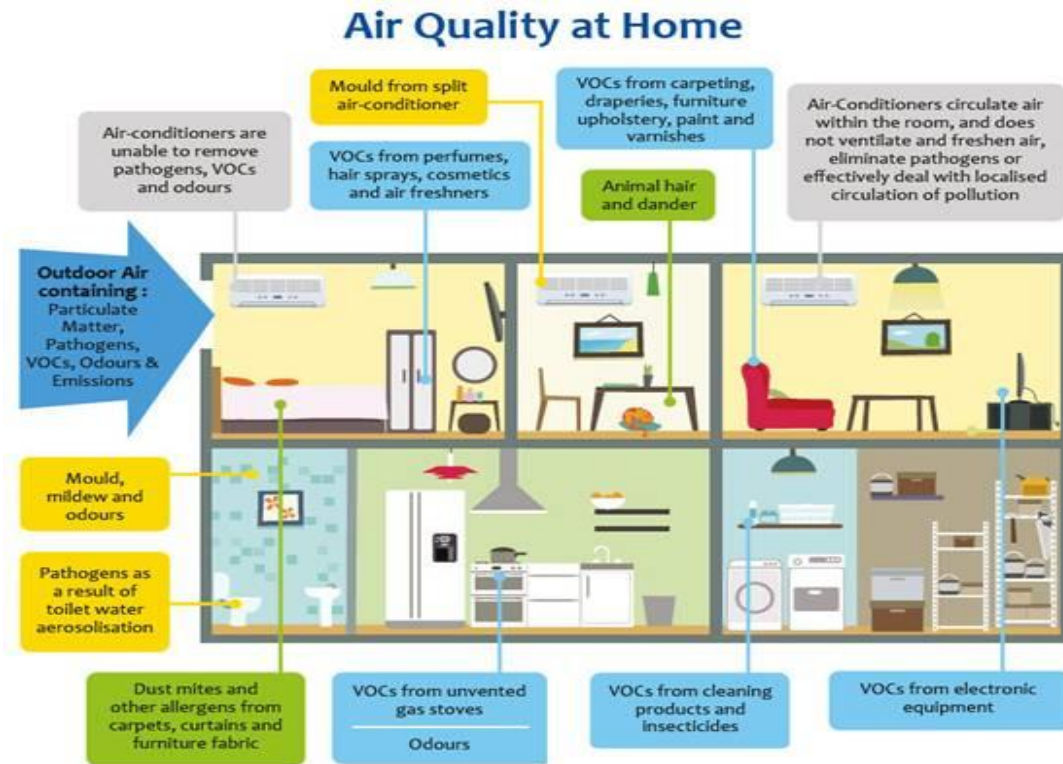


Figure 1. Problems of indoor air quality

2. Existing applications

Several applications are available in the market to calculate or to identify the levels of pollution in various places. Some of those applications are given as follows,

2.1. Air visual pro

This application is used to identify the level of carbon dioxide present in a particular. It is available on market today and anybody can purchase it. The price of this device is a little bit more cost that common people cannot afford to buy it and can use in their homes or their workplaces.



Figure 2. Air visual pro model [7]

2.2. Awair

This device is also used to identify the number of pollutants or the range of the pollution that was being present in our surroundings. This device is designed such that to display the pollutants in the form of the numerical values such that we can identify that and can take some preventive steps such that to avoid or can reduce the amount of pollution that was being present in and around us and in our homes or our workplaces.

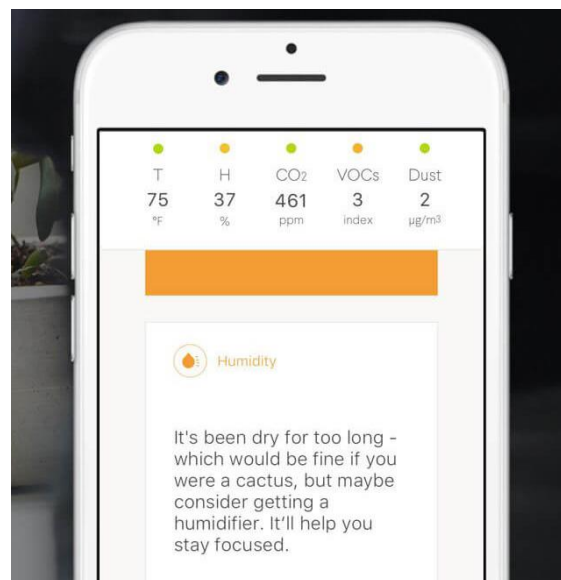


Figure 3. Awair model

3. Proposed work

In the current work, an attempt has been made to solve the problem of Air pollution. This problem can be reduced by increasing the number of plants in and around the surroundings where the level of pollution is more. As the number of plants is increased in number, more carbon dioxide and other gases will be more extracted by these plants and as a result, the contents of these pollutants will be reduced. As a result, the indoor health of the people is safe and clean. For the current issue, the level of pollution in the surroundings was first identified and based on the level of the pollution, the number of plants to be grown in those areas will be suggested to the people whoever is using the current android application in their mobile phones. We choose Indoor plants as the solution to the enhancement of Indoor Environmental Health. In this application, we use GPS to track our current location and display the air composition around our locality. The pollution level was divided into three levels. Depending on the air composition level, the app will suggest the users in some plants be kept in such places that are suitable to minimize the effect on our health. Since plants are the best sources to minimize air pollution, when clicked on the plants suggested you will be navigated to the online stores in which they are available and can be purchased.

The following technologies are used for implementing the proposed App. Android SDK, Google Firebase for User Authentication, Database, and media content storage, Notifications and Analytics, Sensors to analyze the air composition.

4. Implementation and results

The working of the current application can be explained in detail as follows. At first, the current application is an android application that can be run on any mobile phone. As people are using mobile phones most of the time in their office works or their journeys or at their homestays. As a point of interest, it is very easy to provide the information to the users through mobile phones as they are carrying those most of the time with them. Any user who wants to use this application should register them and can have the features of this application. The application will collect the data from various sources and with various applications, it tries to identify the level of various parameters in particular places. The parameters like the temperature, humidity, the level of oxygen, level of carbon dioxide and other SO_2 and NH_3 , etc. by using sensors. The levels of these parameters are classified into three levels and based on the level of the pollution, the number of plants and types of indoor plants that can be grown in and around us.

The levels are, at first level the values of CO_2 and CO are 9ppm or 10 mg/m³, oxygen is 70%, dust is very lite, SO_2 is 0.03 ppm, then the number of plants to be grown suggested in 2 to 3 indoor plants. In the second level, if the value grows to the next level i.e., the CO_2 and CO level to 35ppm or 40 mg/m³, the oxygen level is 50% and dust is moderate and SO_2 level is 0.14 ppm then the number of plants to be grown is nearly 4 to 6 plants. If the above said parameters are more than the said values, the third level can be taken and not only the number of plants to be grown and also some other serious steps will be suggested such that to reduce the levels of the pollution immediate effect. Otherwise, the health of the people who are living or working in such areas will be seriously damaged.

The current android application was developed that to identify the level of pollution present in our surroundings of us and an attempt has been made to suggest the number of plants based on the level of the pollution such that to reduce that pollution. The home page of the current application is as follows. The main motto of this application is to increase the greenery in and around the people in the society either houses or in offices or in some public places.

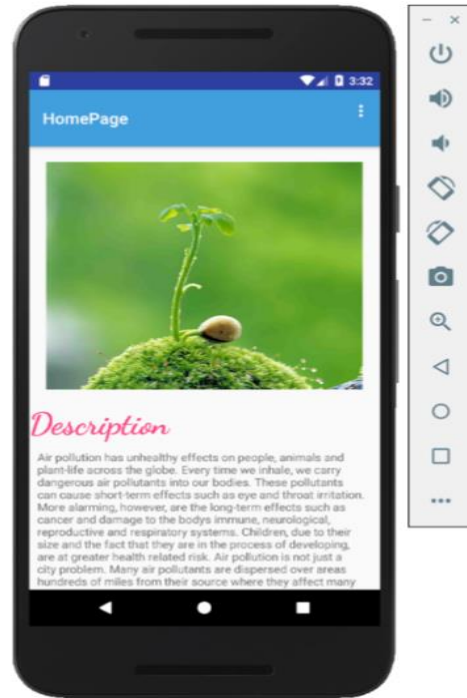


Figure 4. Home page of the application

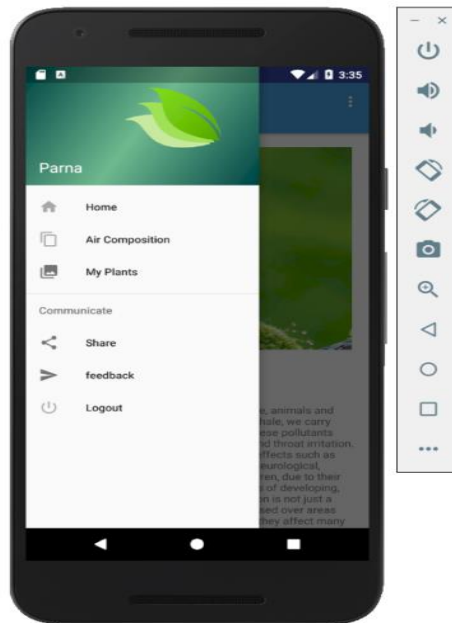


Figure 5

. Composition of the application

On the home page of the current android application, the users can see the details about the various pollutants in the society and their levels of presence and with those levels, what are various issues will be raised and the steps can be followed to control such issues are displayed. It can be understood any person having little English knowledge and no need for much technical knowledge to understand the content of the current application. Various pollutants and their details with the various indoor plants and their details with the advantages and disadvantages of such plants are also given. The number of plants to be grown to reduce the amount of pollution is also given in detail on the home page of the current application.

The components of the application are observed in the above image and the details of the application and other details also will be given in the above image.

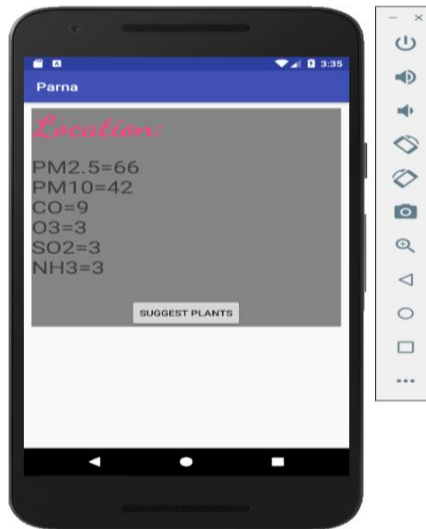


Figure 6. Composition of the various pollutants presence

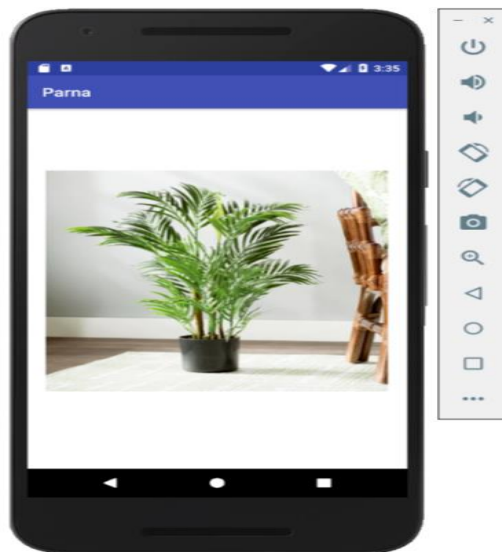


Figure 7. Suggest plants

The various pollutants that were causing the pollution and their level of presence were shown in detail in the above image. The users can easily understand the values and can understand the level of pollution that was present in their surroundings easily. The presence of various pollutants and their levels are shown to the users with the suggestions of how to reduce such pollution levels by growing indoor plants and also some other steps to be taken to reduce the pollution levels was also displayed to the users.

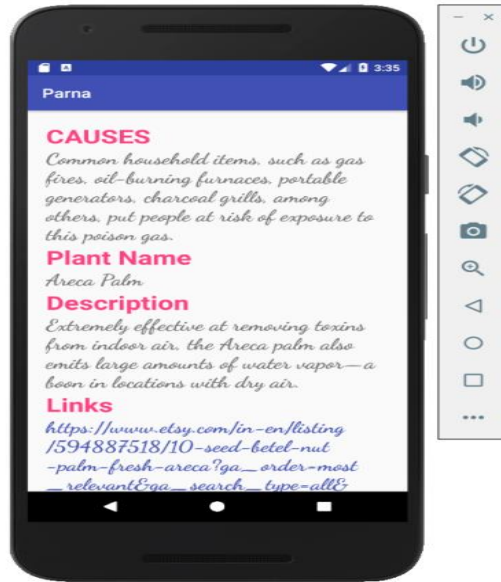


Figure 8. Details of plant

Table 1. The levels of pollution considered

S.No.	Values of pollutants	Level of pollution with solutions
1	CO ₂ and CO are 9ppm or 10 mg/m ³ , oxygen is 70%, dust is very lite, SO ₂ is 0.03 ppm, NH ₃ is 1	Level 1 The number of plants to be grown suggested in 2 to 3 indoor plants.
2	the CO ₂ and CO level to 35ppm or 40 mg/m ³ , the oxygen level is 50%, dust is moderate SO ₂ level is 0.14 ppm NH ₃ is 3	Level 2 The number of plants to be grown is nearly 4 to 6 plants.
3	If the above said parameters are more than the actual said values, the third level can be taken and not only the number of plants to be grown and also some other serious steps	Level 3 Not only the indoor plants to be placed but also some other measures to be followed to reduce the level of pollution.

The number of plants to be placed in the places where pollution is there and the number of plants to be placed and the details about the type of the plants that where people need to be kept in their surroundings can be observed and is suggested to the users of the application. Based on

the level of pollution from the above said three levels, the application will suggest the users with the type of plants to be grown and the advantages and disadvantages of those plants and also the further steps to be taken to reduce the pollution also suggested to the users.

5. Conclusions

This application is very useful to the busiest people who are living in the cities as we know there are very few houses with gardens at present days and at least we can afford the indoor plants for the enhancement of our health. These plants are not much expensive and have the least maintenance. This app helps in knowing the air quality in our home and plant appropriate plants to minimize pollution and enhance indoor health. The main motto of this application was to identify the pollution levels and to suggest the common people grow indoor plants such that to reduce the pollution levels around them. As a result of this, the greenery part will be increased such that the pollution can be reduced.

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