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Mr. Ritesh N. Phalak

College : K.K. Wagh Institute of Engineering, Education and Research, Nashik

Second Prize

Project : **EXPRESS POWER COMMUNICATION TOOL**

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Mr. Abhinav Khandelwal
Mr. Abhishek Sharma

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Third Prize

Project : **MOBILE TALKY TEXT**

Students : Mr. Ajay S. Nath
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AUTOMATIC INSPECTION OF RAIL BALLAST USING GROUND PENETRATION RADAR

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STUDENTS : K.ARUN KUMAR VIKRAM
M.SARAVANA
R.SANTOSH
BRANCH : ELECTRONICS AND COMMUNICATION

INTRODUCTION:

Recent railway accidents in India and its frequency of occurrence have lead to the need for developing sophisticated inspection systems. Recent studies and literature reviews have shown that most of the railway accidents occur due to deterioration in the track subsurface conditions (ballast) and lack of maintenance. Manual inspection methods are tedious and sometimes lead to inaccurate results. So, development of an automatic inspection system with high accuracy and reliability is imperative.

Ground Penetrating Radar (GPR) is an electromagnetic system, which is employed to detect and identify structures within the ground such as the depth of the water table, the existence of pipes and other strata within the soil. Ground-penetrating radar (GPR) is being used extensively as a means for rapid non-destructive site investigation in disciplines ranging from the environmental to the military. This project seeks to automate the processing and interpretation of vast volumes of data to the extent whereby on-site interpretations may be achieved without expert supervision. The team has developed this project exclusively for the automatic inspection of railway ballast. This has been done through the implementation of new signal processing algorithms specifically for GPR data.

PROBLEM DEFINITION:

To develop an automatic inspection system for detection of deterioration of railway ballast. The ballast consists of broken stones of specific dimensions. The stability of the track depends on the depth of the ballast which imparts a cushioning effect to the track. The standard depth of ballast for trunk route is 25 cms for the Broad Gauge and 20 cms for the Meter Gauge. The depth of ballast under the ties has been increased in recent years to accommodate increasingly heavy trains. On some lines this layer is now laid 60.9 cm or even 76.2 cm. thick.

So the goal of this project is to measure the depth of the ballast and the presence of voids within it.

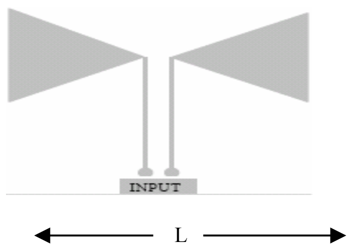
DESIGN:

- Implementation of RADAR involves the usage of ultra wide band (UWB) antennas. UWB antennas need to have
  - Proper return loss
  - Linear phase
  - constant radiation pattern, in the frequency of operation.
- Distances are usually so small that the objects are in the near field of the GPR antenna. Thus, the RADAR equation which assumes far filed conditions cannot be applied without modifications.

- The ground is a lossy medium with attenuation ranging from 10db/m at 3 to 300MHz to 100s of dB/m at GHz frequencies.
- There is a large mismatch at air-ground interface under the GPR antenna.
- Pulse length must be short, of order of few nanoseconds with repetition rates of 50hz to 1MHz with resulting spatial resolution of $0.3/\sqrt{\varepsilon_r}$ to $3/\sqrt{\varepsilon_r}$ m.

BOW TIE ANTENNA:

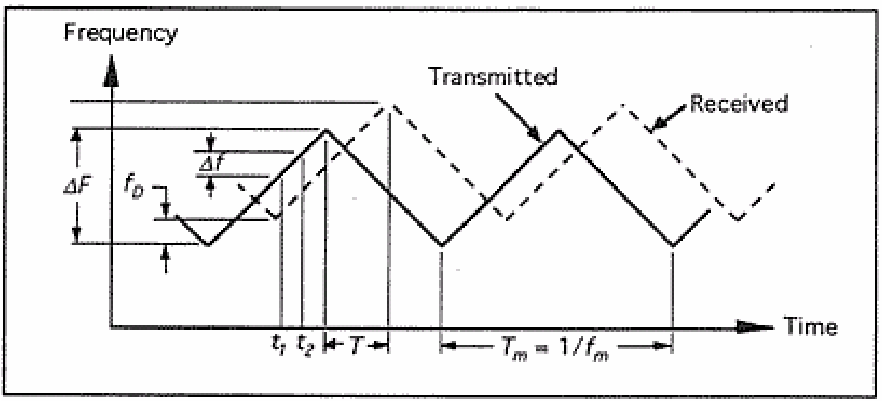
Bow tie antenna is known for its geometry simplicity. The design parameters are as follows



f_b = 400MHz

t_{diff} = 0.5 µs

we have chosen the antenna bandwidth to be 400MHz. the bow tie antenna with 60° flare angle provides a VSWR < 2 over a 2 to 1 bandwidth for L = 0.8 λ at center frequency.



The FMCW system measures the instantaneous difference between the transmitted and received frequencies, Df. This difference is directly proportional to the time delay, Dt, which is takes the radar signal to reach the target and return. From this the range can be found using the usual formula, R = cDt/2. The time delay can be found as follows:

Dt = T Df/(f_2-f_1) where:

f_2 = maximum frequency
f_1 = minimum frequency
T = period of sweep from f_1 to f_2,
and Df = the difference between transmitted and received.

IMPLEMENTATION:

FREQUENCY MODULATION CONTINOUS WAVE RADAR:

In FMCW radar, a sinusoidal signal is used. The sine signal frequency is swept within a frequency band. Reflected signal strength is measured at different frequencies. This gives direct frequency spectrum.

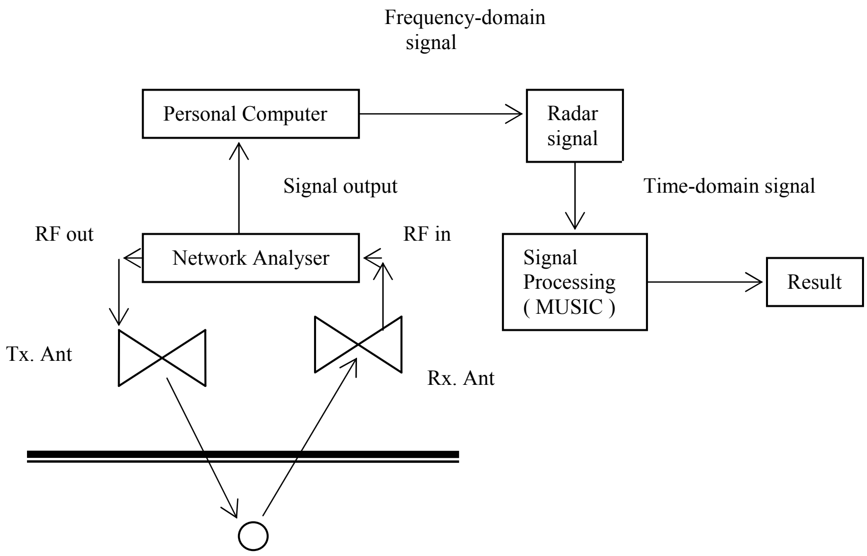
Used a Vector network analyser as a GPR, which is based on SFCW (step frequency continuous wave) RADAR. Its similar to FMCW except for the change in sweep frequency takes place in steps in a vector network analyser. The **vector** network analyser transmits the frequency-domain complex signal which has real and imaginary parts and received the complex-reflected signal at different frequencies. This reflected frequency-domain data is considered as a radar signal.

The impedance matching is done by using balun transformers at both transmitting and receiving antennas.

VECTOR NETWORK ANALYSER :

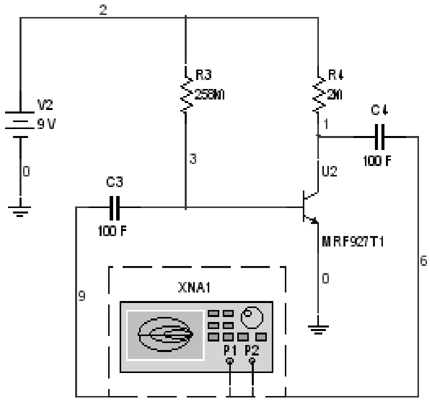
The network analyser is used to measure the scattering parameters (or S-parameters) of a circuit, commonly used to characterize a circuit intended to operate at higher frequencies. The network analyzer also calculates H, Y, Z parameters.

The block diagram shown below gives the overall view of the GPR system



- Connect rx ant to Rf in port of VNA.
- Connect tx ant to Rf out port of VNA.
- Choose the s parameters.
- Set sweep frequency range frequency.
- Specify the step of increase.
- Choose plot of power spectrum.
- Save the result and transfer it to computer using USB interface.
-

The figure shown below is the shaping circuit used with vector network analyser. The circuit has been simulated using Multisim.



This is a Stepped Frequency Continuous Wave (SFCW) radar system based on Agilent RF Network Analyzer. Data range is 1 MHz to 401MHz. Since the point is set to 401, the frequency interval is 1 MHz. Different sets of experimental data were taken from 0 to 3 meters at the interval of 15 cm using bow-tie antenna.

SIGNAL PROCESSING:

1. The frequency domain RADAR signal is obtained from the vector network analyzer.
2. The RADAR signal is subjected to MUSIC processing to obtain high time-delay resolution.
3. A smoothing process is performed on the processed data to further enhance the efficiency of MUSIC algorithm.
4. The SNR analysis is done on MUSIC processing and its relationship with M (number of snapshots) is determined.
5. 2D and 3D plots of MUSIC are plotted and the GPR results are obtained.

MUSIC PROCESSING:

The MUSIC algorithm is a nonparametric spectral estimation technique, which estimates multiple scattering centers from the observed voltage received on an array of antenna

utilizing the eigenvector. The eigenvectors can be used to compute a spectrum with DOA (direction of arrival) and estimate delay time of high-frequency spectrum. The eigenvalue of diagonal matrix helps to estimate the numbers of reflected signals.

Form the new data vector

The measured value of reflected signal from the target with a vector network analyzer can be expressed using vector notation as follows:

$$\mathbf{x} = \mathbf{Ay} + \mathbf{w}$$

Map the data vector by 2-d prefiltering matrix

Estimate the sample covariance matrix

Estimate the signal subspace covariance matrix

$$\mathbf{S = XX^* = (Ay+W)(Ay+W)^*}$$

Also, arriving wave and internal noise can be considered as not related (orthogonal), and the signal covariance matrix becomes

$$\mathbf{S} = \mathbf{APA}^* + \sigma^2 \mathbf{I}$$

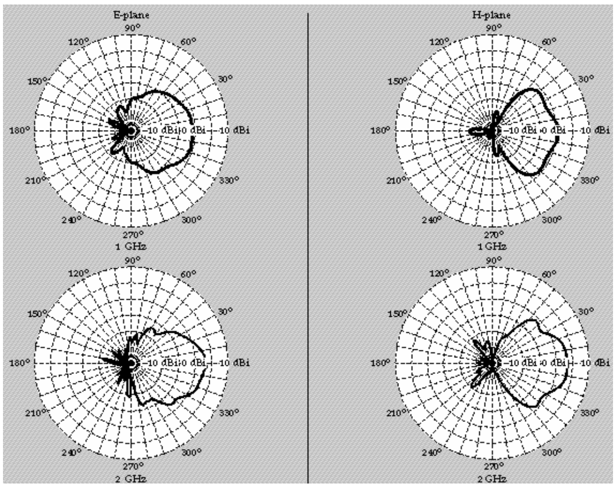
Obtain the MUSIC spatial spectrum

$$\mathbf{P_{music}(\Theta) = [a(\Theta) * a(\Theta)] / [a^* (\Theta) E_N E^*_N a(\Theta)^2]}$$

where **a(Θ)** is a delay-time mode vector and **E***N* is the noise *L* (*L* − *k*) matrix whose columns are the (*L* − *k*) noise eigenvector.

RESULTS:

The diagram shows the radiation patterns of bow tie antennas at 1GHz and 2GHz.

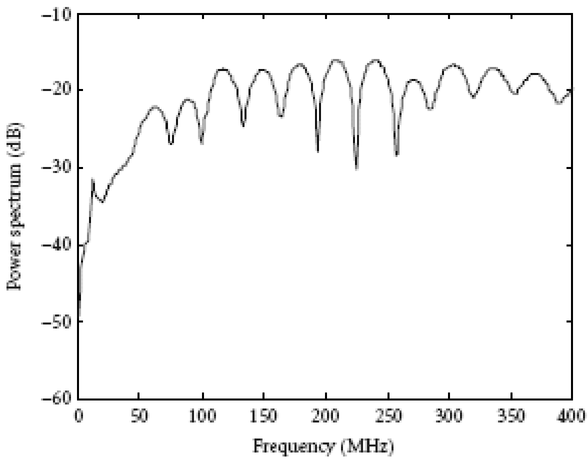


The following table shows the antenna parameters and physical and electrical characteristics of inspection area.

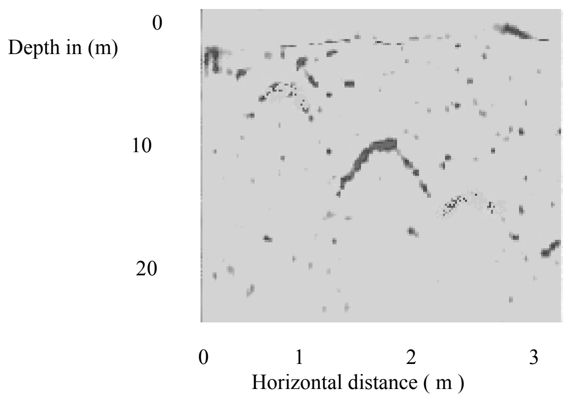
PARAMETERS	VALUES
Frequency bandwidth	400MHz
Frequency Interval	1MHz
No. of points	401
Conductivity	0.025S/m
Permittivity	32
Void diameter	6 cm
Vertical target separation	10 cm

In our experiment we estimated the acquired RADAR signal to be

$$\mathbf{H(f) = (j(\omega_0/Q)\omega) / [(\omega_0^2 - \omega^2) + j(\omega_0/Q)\omega^3)]}$$



The following diagram shows the 2-D representation of MUSIC processing of data at M+10 and L=50.



From the radar image, we can obtain the information about the presence of voids and other subsurface deteriorations.

SNR ANALYSIS:

Input SNR is calculated as by summing the total energy of the signal and noise, because the input signal and noise is frequency-domain spectrum. The simulations are performed using MATLAB and the random noise generator functions is used to generate noise. To calculate the SNR the MUSIC processing is performed with signal (peak value) and noise (RMS value) separately and the time domain response is obtained.

$$SNR_{input} = 10 \log \left[\int (| S(f) |^2 df) / \int (| N(f) |^2 df) \right]$$

$$SNR_{output} = 20 \log (V_{o-p}) / \sqrt{((1/n)\Sigma | N(t_i) |^2)}$$

No. of snapshots (M)	Input SNR (dB)	SNR of MUSIC response (dB)
30	-14.9	11.1
30	-5.8	13.2
30	-4.1	11.7
30	2.9	12.5
30	7.0	12.8

The SNR analysis was performed and the results were found to closely follow as provided by I.Arai et.al., [1].

LIMITATIONS:

The Agilent technologies RF network analyser is limited for frequencies between 300KHz to 1.5GHZ.The efficiency of the MUSIC algorithm is limited to the coherency of signals and can be enhanced by smoothing process.

COST OF BUILDING THE EQUIPMENT:

Antenna design	:	Rs.870
Circuits	:	Rs.65
Hardware setup (feed system and interfaces)	:	Rs.1200
Inspection unit setup	:	Rs. 1350

CONCLUSION:

Thus the team have developed and implemented a GPR system for detecting voids in rail ballast. The MUSIC algorithm for processing RADAR signal has been made efficient by spatial smoothing process. The algorithm can be further enhanced by employing modified smoothing process. The system when attached with a test vehicle can continuously inspect the ballast along the track and produce necessary results. In addition to the significant reduction in the processing and interpretation times, it provides added consistency and a reduced false-alarm rate.

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6. Hugenschmidt J., Railway track inspection using GPR, J. Appl. Geophys., 2000, 43, pp. 147-155

MOZILLA FIREFOX EXTENSION FOR COLORBLINDS

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GAURAV APPA SAVKAR
BRANCH : COMPUTER SCIENCE

INTRODUCTION:

Colorblindness is the inability to perceive differences between some or all colors that other people can distinguish. According to medical reports, around 8% of people in world are colorblind, which is a considerable number.

Colorblind people find it difficult to browse the web for a long period of time and they also, are not able to recognize the meaning of some images present on the Web pages.

The software is an extension to the Mozilla Firefox web browser. This extension personalizes Web browser for colorblind people. The user will undergo a test, which will verify and then identify colorblindness of that person, when he/she uses our Web browser for the first time. This test is Ishihara test for colorblindness detection, which is conducted on the browser only. If the user has any kind of colorblindness, then this project personalizes the web browser by applying appropriate filters, which helps the user distinguish colors better. This our project helps the colorblind people browse the Web efficiently.

For development of this Browser extension the team has used Mozilla Firefox as target browser and the extension software is developed in XUL (XML User Interface Language), JavaScript and image processing is done using Java Advance Imaging (JAI).

MOTIVATION:

Colorblind people are very rare, but the things change when someone is around. If the person anomalous colorblind, that is he can not distinguish between red and green colors. So we searched the web for some kind of aid for colorblinds. The project team had found nothing that could really help colorblinds while browsing in the web. Hence the team decided to develop this software.

CURRENT TECHNOLOGY ASPECTS:

A lot of literature available in market discussing on how to design web pages and choose color combinations, so that colorblind people can also perceive these pages without any difficulty. But there are 8 types of colorblindness and web page developer is generally a normal vision person, so it is difficult as well as time consuming to develop such web pages. If someone decided to develop such web page, then it would be purely black and white. So, it would be better if web browser takes care of such things.

Tinted filter glasses are available in market but they are more costly than gold. Also, the user has to carry these glasses with him, wherever he goes. The cost, usability and durability of these glasses are not feasible to the user. Also software which are available today, just give the color of pixels where mouse points.

APPLICATIONS:

1. **Colorblindness Testing:** As this software includes Ishihara test for colorblindness detection, the user is able to check if he is colorblind or not. If he is found to be colorblind, his type of colorblindness will also be determined.

2. **Aid to Colorblind People:** As this software personalizes the web browser by applying appropriate filters to Web pages, which helps the colorblind user distinguish colors better.
3. **Image Enhancements:** As this software can also be used as image enhancement tool. Enhancements include noise reduction and sharpening image.
4. **Pathology Slides Enhancements:** Generally, pathology slides contain red and blue stains. Doctors and scientists who are colorblind find it difficult to analyze pathological slides, under the microscope. So they may come to wrong conclusions. This software can help them by filtering the images of these microscopic slides.

PROBLEM DEFINITION:

To develop Mozilla Firefox extension for color blinds, this will detect colorblindness and also its type. The software will apply appropriate filter to the Web pages according to the type of colorblindness of user. This filter will consist of image as well text filtering. In order to create awareness about colorblindness, the software should also be localized in as many languages as possible.

CONSTRAINTS:

This software is an extension to browser. And it will be used for filtering online web pages. Thus performance time is major constraint in developing algorithm for filtering images present on the web page. Also software will work using limited facilities provided by browser.

APPLICATION FOCUS:

Many people complain about eye strain and headaches, while browsing Web for a long period. Most of these are colorblind, but due to unawareness they either ignore the problem or are not able to figure out the reason behind it. Also due to inability to perceive difference between colors, they often loose valuable information.

The main objective is to create awareness about colorblindness and help colorblind people to browse the Web effectively. With the use of filtered Web pages, user should feel the ease of browsing.

DESIGN APPROACH AND DESIGN

PRODUCT PERSPECTIVE:

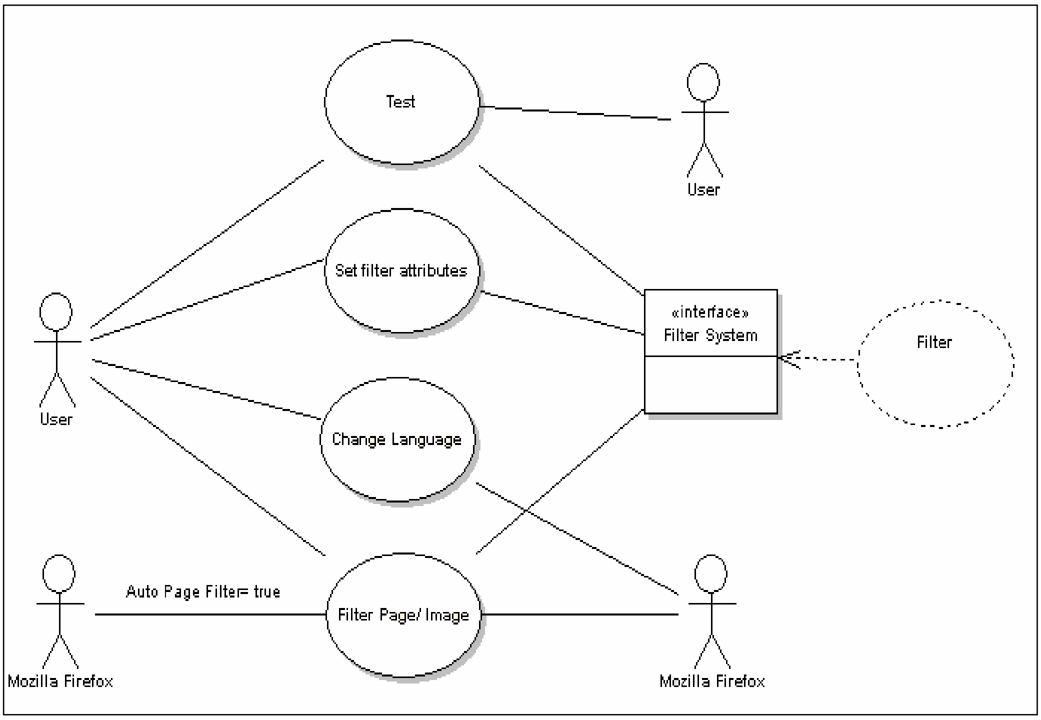
The end product of this project is a browser extension which helps identify the type of colorblindness the user has by conducting standard Ishihara Test once. Once the type of colorblindness is identified the extension applies appropriate filter to the Web pages.

The software is completely new concept and extends Mozilla Firefox. Thus this software is a component of the Web Browser and interacts with it.

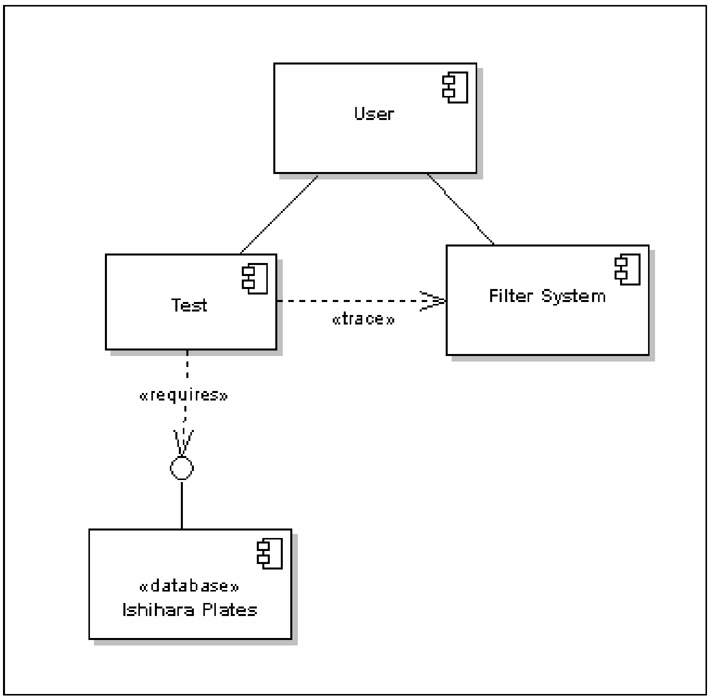
Inputs (required by the project): The whole designing process is based on the available source code of Mozilla Firefox. Browser extension just needs type of colorblindness to apply proper filter.

Outputs (deliverable from the project): Filtered web documents as per the type of colorblindness of user, which is unambiguous to the user.

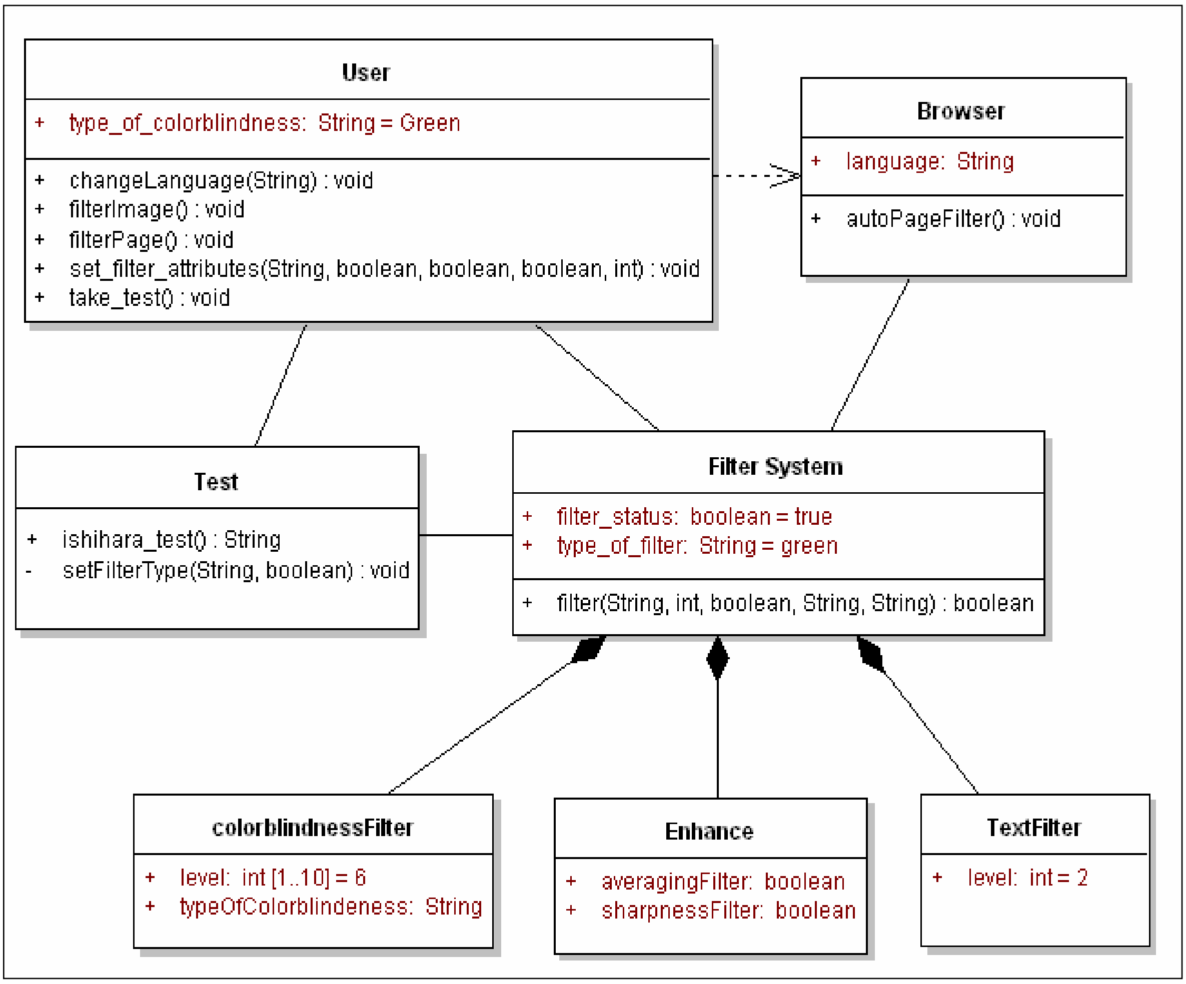
UML Schematic Diagram:



Use Case Diagram



Component Diagram



Class Diagram

SYSTEM FEATURES:

1. **Colorblindness Detection Test:** The Browser extension software provides a standard Ishihara Color Test. This feature allows us to detect colorblindness of the user, so as to set the filter properties according to results.

   The Ishihara Color Test consists of a number of colored plates, each of which contains a circle made of many different sized dots of slightly different colors, spread in a random manner. Within the dot pattern, and differentiated only by color, is a number. If, a number is visible indicates if and what form of color blindness of the viewer. The full test consists of thirty-eight plates, but the existence of a deficiency is usually clear after no more than four plates.

2. **Filter System:** Filter System is another feature of the software. This feature allows user to filter web pages.

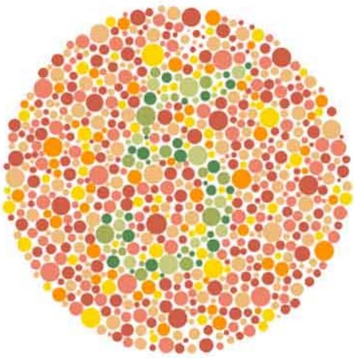
   This filter system consists of code to apply various filters to the web page so as to aid the colorblind people in differentiating colors better. The filter system takes the type of colorblindness of the user as input and accordingly applies filters to the web pages. The filter system is divided into three parts: image filter, page filter and text filter.

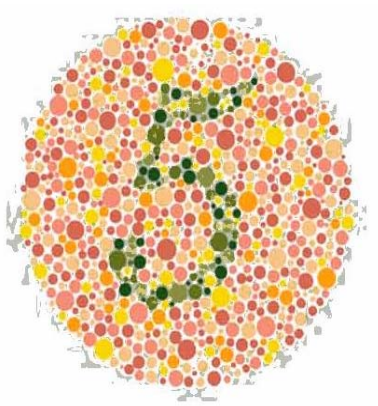
   Using the image filter, user is able to filter any individual image which is either present on any web page or which could be opened in browser window.

On enabling the auto page filter option, every time the user will enter URL of web page and hit Enter key, the page will be downloaded, all the images on the page will be filtered automatically and then displayed to the user.

The text filter increases the contrast between the foreground and background colors of the text present on the web page. This increases readability of the text and reduce strain on eyes. Example of filter system is as given below. Following images show the filter work for green colorblind.

Original Image Filtered Image (by the software)





3. **Manual Filter Editing:** The Ishihara test for colorblindness detection only tells us the type of colorblindness, but not its severity. Yet another feature of this software is to allow the user to manually change the filter settings. This facility is added for advanced users. Using this feature, user may personalize the filter according to his needs and which is suitable to him.

   The only constraint for using this feature is that the filter system should be enabled first. If the filter system is disabled then the effect of filters will not be visible to the user even when the filters are edited.

PRODUCT FUNCTIONS:

The Browser extension software has the following functions:

- Ishihara Test For Colorblind: The identification and verification of colorblindness of the user.
- Individual Image Filter: This function filters any single image according to the type of colorblindness.
- Page Filter: This function filters all the images present on the page according to the type of colorblindness.
- Text Filter: This function filters the text present on the page displayed in browser window.
- Enable/Disable Filter: The user is given the option to either enable or disable the filter according to the type of his colorblindness.
- Edit Filter: The user can edit various aspects of filter for better personalization.
- Localization: The extension software is localized in 5 languages; English, Marathi, Hindi, French and Chinese.

It is mandatory for the user to take the standard Ishihara Test for Colorblindness at least once.

DESIGN AND IMPLEMENTATION CONSTRAINTS:

As interrupting the flow of data form browser to the screen for modifying colors by applying filters, it may slow down the browser a bit. To solve this problem optimized the algorithm in terms of its time complexity.

On the other hand, if a colorblind person is really able to read a page, which he could not previously, this small time lapse will not bother him.

IMPLEMENTATION:

SOFTWARE USED:

- Mozilla Firefox ver.2.0
- Java Development Kit ver.1.4

SYSTEM SPECIFICATION:

- 733 MHz Pentium or compatible processor
- 256 MB of RAM
- 10 MB of free disk space
- Microsoft Windows 98
- Mozilla Firefox ver.2.0 and Java Run time Environment (JRE) ver.1.4 or more

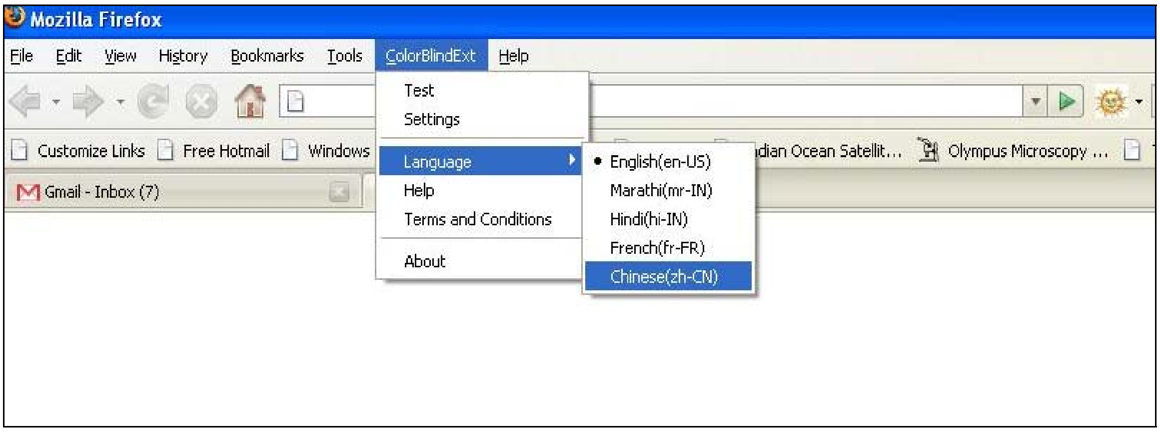
PROGRAMMING LANGUAGES:

- XML User Interface Language (XUL)
- JavaScript
- Java Advance Imaging (JAI).

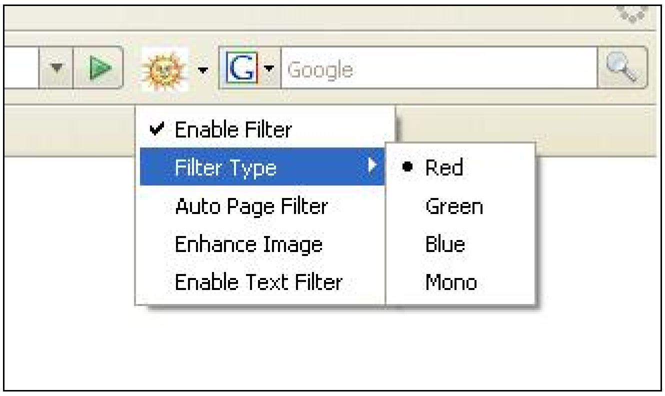
Platform: Windows 9x/XP

Coding Style Followed: Java style

PHOTOGRAPHS:



ColorblindExt Menu Added To Browser



Toolbar Button For Quick Access

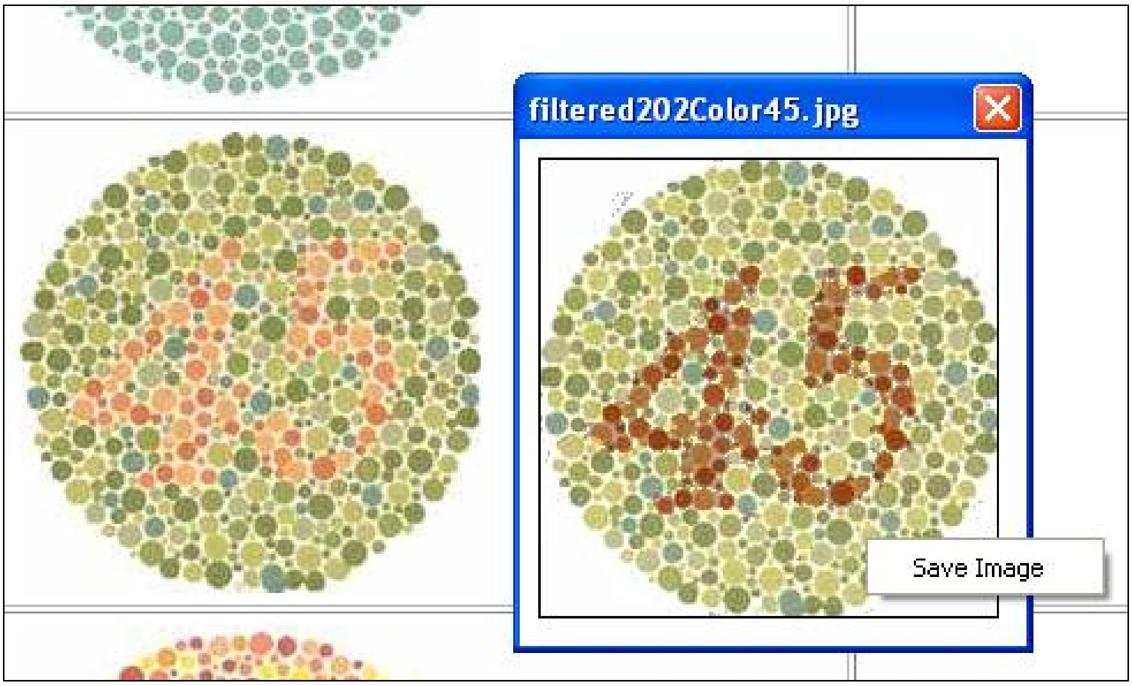
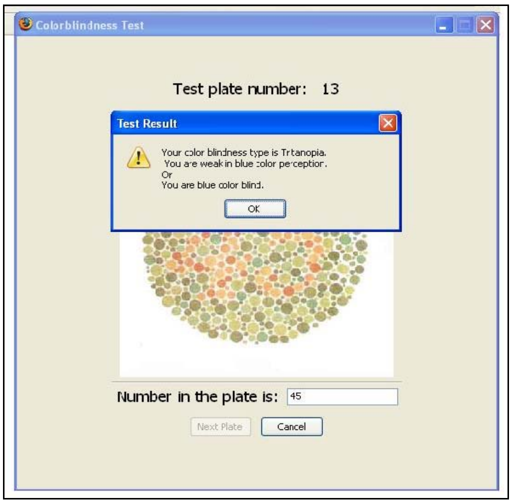
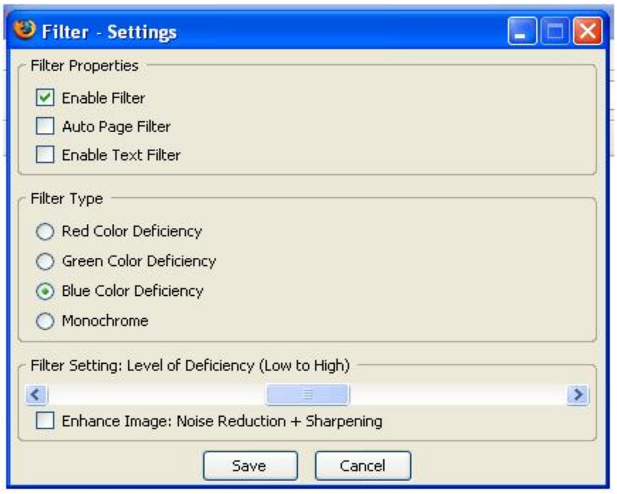


Image Filtering Using 'Image Filter' Popup

Image Enhancements



Colorblindness Detection Test Result



ColorBlindExt Settings Window

SOFTWARE TOOLS USED:

- **UNIRED:** For encoding DTD files in UTF8 format.
- **Adobe Photoshop:** For cleaning Ishihara test plates.
- **JBuilder:** For developing java code.

TESTING:

The test strategy consisted of a series of different tests that fully exercised the extension software. The primary purpose of these tests was to uncover the systems limitations and measure its full capabilities. A list of the various tests undertaken and a brief explanation of the respective follows below.

1. **System Test:** The System test was focused on the behavior of the extension software. User scenarios were executed against the system as well as screen mapping and error message testing. Overall, the integrated system was tested and verifies that it meets the requirements defined in the requirements document.
2. **Performance Test:** Performance test was conducted to ensure that the extension software's response times meet the user expectations and do not exceed the specified performance criteria. The response times of filters applied to the images on the web pages were measured under heavy stress and volume.
3. **Stress and Volume Test:** The extension software is subjected to high input conditions and a high volume of data during the peak times. The Filter System was stress tested using twice (10 web pages) the number of expected web pages to be filtered.
4. **User Acceptance Test:** When the extension software was implemented, it performs the User Acceptance Testing. The purpose of these tests was to confirm that the system is developed according to the specified user requirements and is ready for operational use. In this testing, care was taken by the team to test the software from as many colorblind people as possible.

The colorblind people were also present during the final product review.

FUNCTIONS TESTED:

The following is a list of functions that were tested:

- Ishihara Test for Colorblindness Detection
- Test result

- Filter Settings
- Filters applied to the images.
- Localization Feature
- Error messages
- Screen mappings (GUI flow). Includes default settings

PROBLEMS ENCOUNTERED:

1. **Limitations of Java Applet:** After starting with the extension development, the team decided to use applets for image processing. But later found out that applets have their own limitations. The team found out that applets do not have file write access. Also, processing images using applets was very time consuming.

   This problem was overcome by using Java Advance Imaging (JAI), instead of applets, for image processing. Use of JAI reduced the time required for image processing and also provided us the file write access.

2. **Speed of Image Processing:** Even after using JAI, image processing was not optimized as the images to be filtered were again downloaded using their URL. Thus major chunk of the overall time required for image processing was this downloading time.

   Total time to filter images = Time for downloading images + Time taken by JAI for image processing

   To overcome this problem, images were directly taken from the browser's cache. This reduced the total time to filter images.

   3. **Temporary Image Storage:** The cache of Mozilla Firefox is different from those of other browsers. It is encrypted. This means that only read images from the cache, but cannot replace them.

      Thus, it created its own caching scheme. Every time the user opens a new browser window, a new unique cache is created in the extension folder. All the images are stored in this cache after being processed.

Costing:

Ishihara Test Plates (38 Plates)	Rs. 5000 /-
Books/Journals On Colorblindness	Rs. 1049 /-
Total	Rs. 6049 /-

ADVANTAGES AND BENEFITS:

The advantages of this project are as follows:

1. **Approach:** Web page developers may keep colorblindness into account, but many times they are normal persons. Also, there are **8 types** of colorblindness. Due to the above reasons, it is difficult for them to design web pages for color blinds. So it will be feasible if the web browser takes care of such things.

2. **Easy To Use:** The project is easy to use and any person who could browse the Web will be able to use. Also, using standard Ishihara test, which is the simplest test for detecting colorblindness.

3. **Cost Benefit:** As stated above, the project has a different approach than the existing ones. The Web page developers will not have to waste their time and energy in studying colorblindness and developing web pages suited to colorblind people. Also, this project is open source software and hence free of cost.

4. **Awareness:** This project provides an easy way to test colorblindness, which will create awareness about colorblindness.

SYSTEM LIMITATIONS:

1. **Processing GIF Images:** Many of the GIF images are animated and have multiple frames. For better performance, the extension filters only one frame of GIF images. Due to this the original animated nature of the GIF image is lost.
2. **Handling Dynamic Contents:** Web pages developed using AJAX can display elements dynamically without refreshing the whole page. If 'Auto Page Filtering' is used, then only static contents of the web page will be filtered and not the dynamic ones such as those developed using AJAX, Java Applets, etc.

CONCLUSION:

Use of the image filters has reduced the loss of information for colorblind people. Colorblind people found this software very beneficial and were surprised to see the things on the web pages which they couldn't see without filters. The percentage of colorblind people is around 8%. This percentage is according to the surveys done over limited population. After taking the colorblindness detection test present in this extension software, we expect this percentage to increase.

Now this extension is available for all, on Mozilla's addon site from following link:

https://addons.mozilla.org/en-US/firefox/addon/5001

Thus this software will increase awareness about colorblindness and aid colorblind people to browse the Web effectively.

ACKNOWLEDGEMENTS:

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[3] Information on Color Blindness http://www.toledo-bend.com/colorblind/

[4] http://www.google.com

A RFID IMPLEMENTATION FOR LOCATION AND PROXIMITY SENSING FOR THE BLIND USERS

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INTRODUCTION

This project mainly focuses on visually impaired group of people who were all usually out off the big companies' scope. Since the number of this group is small, the big companies don't focus mainly on investing in its needs. This project will surely act like a visual indicator to them. In such a way it's a navigation and location determination system for the person with visual impairment using RFID tags. Each RFID tag is programmed upon installation with and information describing the surroundings. With an established RFID infrastructure blind peoples will gain the freedom to explore and participate in activities without external assistance. An established RFID infrastructure will also enable advances in robotics, which will benefit from knowing precise location. In this Project, an RFID-system with an RFID reader integrated into the user's handling with a CPLD circuit design to the user's earphone, which incorporate APR9301 Voice recorder analog IC. An emphasis is placed on the architecture and design allowing for a truly integrated pervasive environment with minimal visual indicator in future to the outside observer.

CURRENT PROBLEM

When the visually impaired persons enter a building they are not familiar with, they are lost, and often have to feel their way around.

- They depend on other people or need something else to navigate.
- The blind face several challenges such as:
  - Limitation in pre-viewing and
  - Pre-processing of spatial information
  - Difficulty in avoiding obstacles and detecting hazards
  - Loss of distant landmarks and
  - No access to spatial representation

DESIGN

The problems in user location detection for the blind are complicated by the challenges of resolution, accuracy, privacy, user orientation and reliability. This project presents a solution to the problem of way finding for the blind on environment in which he/she survives. Design principles were.

Equitable Use: The design is useful and marketable to people with diverse abilities.

Flexibility in Use*:* The design accommodates a wide range of individual preferences and abilities.

Simple and Intuitive*:* Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

Perceptible Information*:* The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Tolerance for Error*:* The design minimizes hazards and the adverse consequences of accidental or unintended actions.

Low Physical Effort: The design can be used efficiently and comfortably and with a minimum fatigue.

METHODOLOGY:

- **Transmitters:** The part of the system is to be mounted on navigating system. The goal of this element is to send signal to the reader, which is carried by the user. Contains a unique identifier to route correctly.
- **Receiver:** This is a device that the user will carry. The goal of this element is to catch the emitted signal. Once the signal is received the device should send voice signal so that the user knows that it is permissible to travel safely.
- **CPLD:** Complex Programmable Logic Device in which the output voice will be activated through verilog coding.
- **VoiceRecording:** The integrated chip due to its high level storage capablity in which the analog voice signal will be stored for unique ID of the tag
- **Earphone/speaker:** All the output device in which the caution and directional voice will be heared by the blind

HARDWARE SPECIFICATION

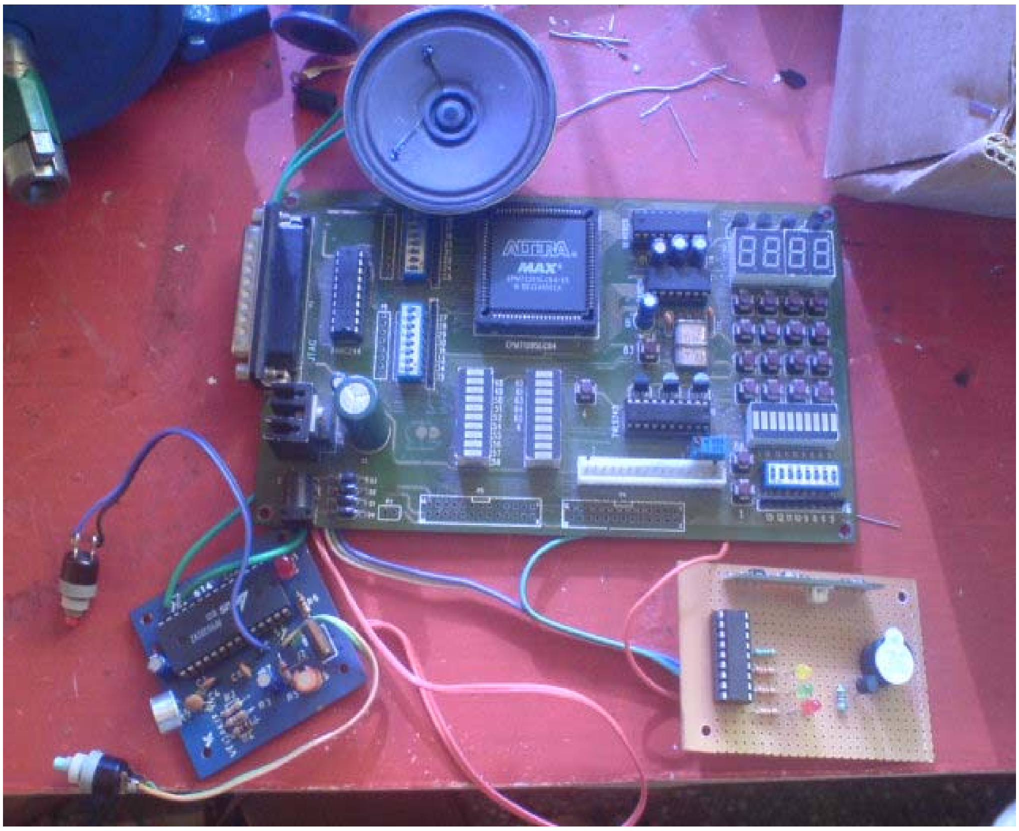
- RFID TAG - ACTIVE
- TRANSMITTER
- READER
- CPLD DEVICES
- VOICE RECORDER IC
- EARPHONE/SPEAKER

SOFTWARE SPECIFICATION

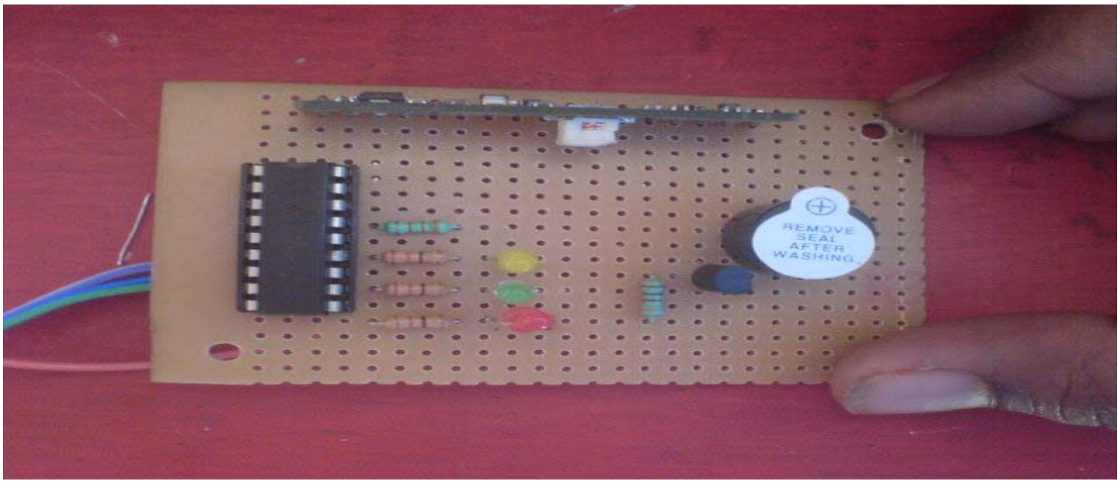
ALTERA QUARTUS

PHOTOGRAPHS:

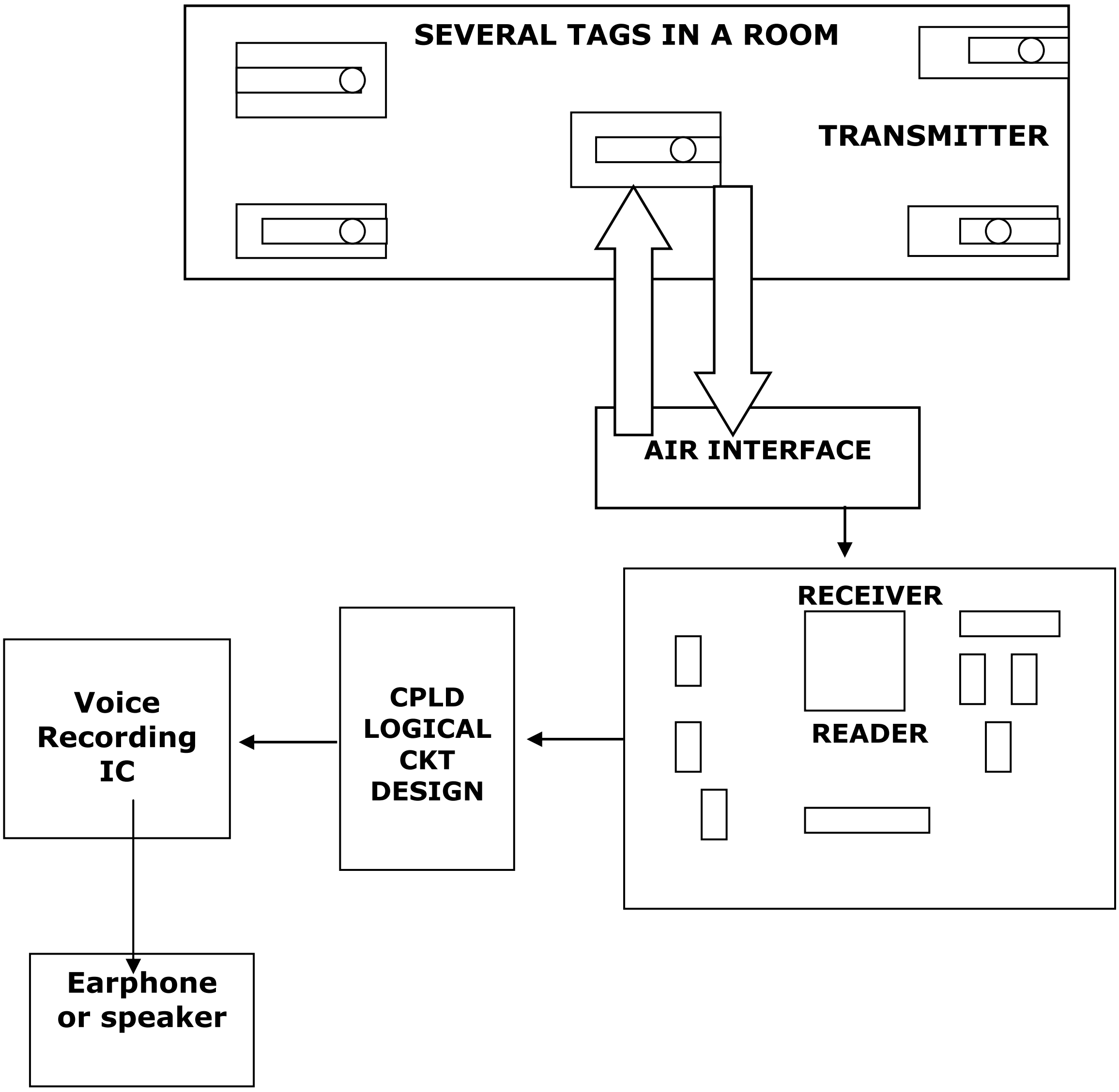
RECEIVER



TRANSMITTER



BLOCK DIAGRAM

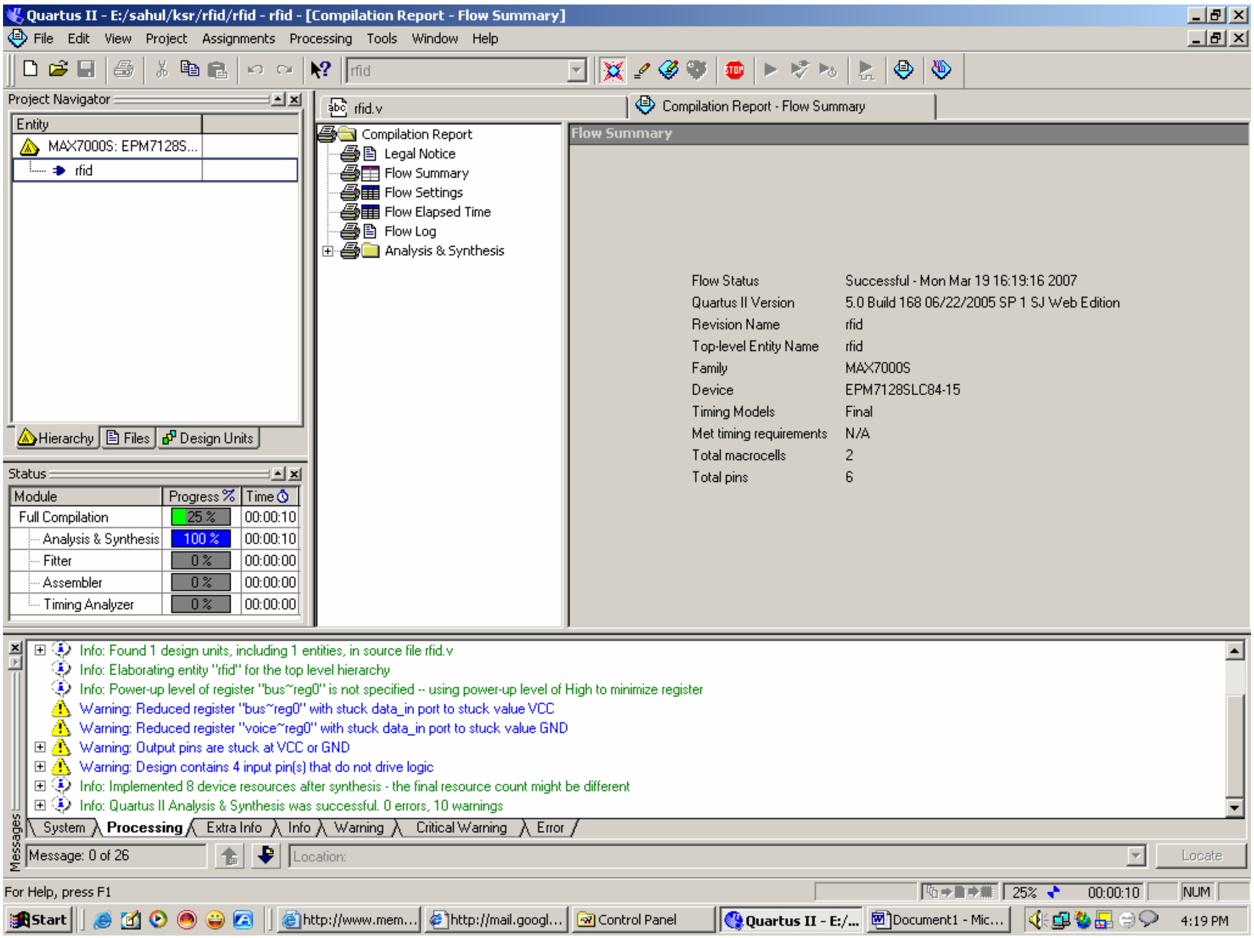


TESTING:

HARDWARE:

The active tag is attached in objects which act as the transmitter. A visitor or a visually impaired person were asked to carry a receiver which encompasses the reader, CPLD, voice IC .The voice will be generated regarding the précis's description of location about 20 seconds. In this manner any number of tag can be attached in a building for ease identification

SOFTWARE:



PROBLEMS ENCOUNTERED:

While testing this project the team had faced some challenges such as:

- Noisy environment were generated within voice IC
- Power consumption comparatively higher than expected.

ADVANTAGES AND BENEFITS:

- Cost effective it can be easily used by layman too.
- Easy to migrate
- Relatively less for a building installation
- Minimizes the impact of installation and maintenance to the building owner.

IMPROVEMENT

- In future mobile based system will be evolved
- New product can be generated with this framework

SUGGESTIONS FOR FUTURE WORK

With an established framework for reliable and accurate location sensing, the challenges of communicating to the user with an awareness of their surroundings need to be addressed. In future the work can be implemented with the help of mobile phones. While compared to that system this RFID tag system implementation is economical and used by the layman also effectively.

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