Image Processing and Data Visualization for the Public Health Monitoring System of Filipino Children

User's Manual
Presented to
the Faculty of the College of Computer Studies
De La Salle University

In Partial Fulfillment
of the Requirements for the Degree of
Bachelor of Science in Computer Science

by

Cardano, Marc Daniel T.
Dy, Stephanie Joy D.
Lim, Reanna Chelsey N.
Pagtalunan, Dominic M.

Judith J. Azcarraga, PhD
Adviser

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1.0. INTRODUCTION

The Public Health Monitoring System for Filipino Children is a telemedicine system that aims to fulfill the need for children to undergo routine wellness checks with a doctor in communities that may not have accessible, affordable or quality healthcare. It serves as a go between patients and doctors that cannot find the time to meet for a check up. Basically this system allows a software with an assistant, not necessarily medically trained personnel, to perform the basic health monitoring activities for children and store these results for doctors to view and diagnose at a later date.

The system consists of three mobile applications developed for Android tablets: GeeBee for monitoring and consultation activities. GeeBeeCapture for calculation of height and weight via image processing. GeeBeeView for displaying the collected data. The target users of GeeBee and GeeBeeCapture are children aged 6 to 14 years old and their assistants while GeeBeeView are for doctors and medical personnel or authorities planning for children's healthcare.

1.1. SYSTEM REQUIREMENTS

GeeBee
Operating System: Android
Minimum Android version: Android 4.1 (Jelly Bean)
Permissions: Camera, Microphone, Storage, Network Communication, Affects Battery
Hardware: Camera, Speakers, Microphone
Accessories: Stylus, Earphone/Headphone

GeeBeeCapture
Operating System: Android
Minimum Android version: Android 4.4 (KitKat)
Permissions: Camera, Storage
Hardware: Camera

GeeBeeView
Operating System: Android
Minimum Android version: Android 4.4 (KitKat)
Permission: Storage, Network Communication

1.2. INSTALLATION

There are no prerequisite requirements for the installation of the applications for this system however these applications must be installed on Android tablets. To install the mobile applications under this system, simply use the apk provided.

Note: When installing *GeeBee*, *GeeBeeCapture* will also be installed because they have interrelational functions. *GeeBeeView* can either be installed on the same tablet or separately from *GeeBee*.

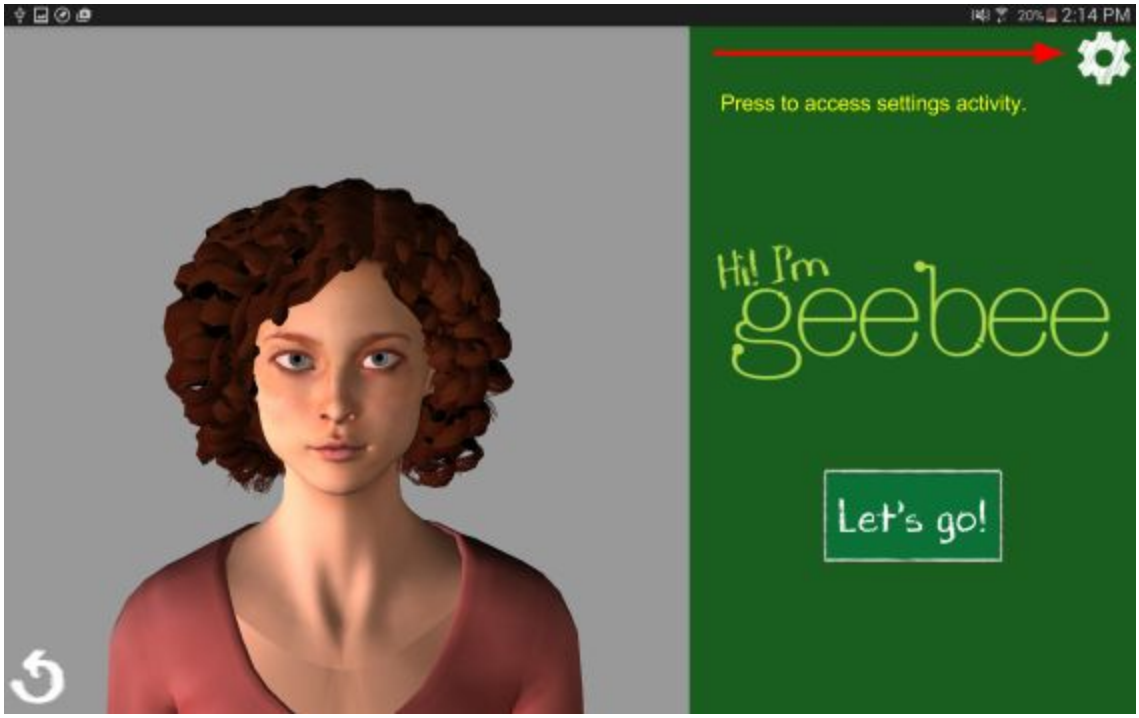
This software is originally intended be a module or an additional part to the existing “GeeBee” app.It comes prepackaged already with the original application, “GeeBee” . Hence, installation of Geebee will have such software to be installed as well. To install the required systems, simply tap install apk when prompted. The android device will automatically install the software.

2.0. GEEBEE

This application is responisble in consolidating and recording data. Now it is capable of also uploading to a cloud database. All the modifications and additions are all in one Activity only the settings activity.

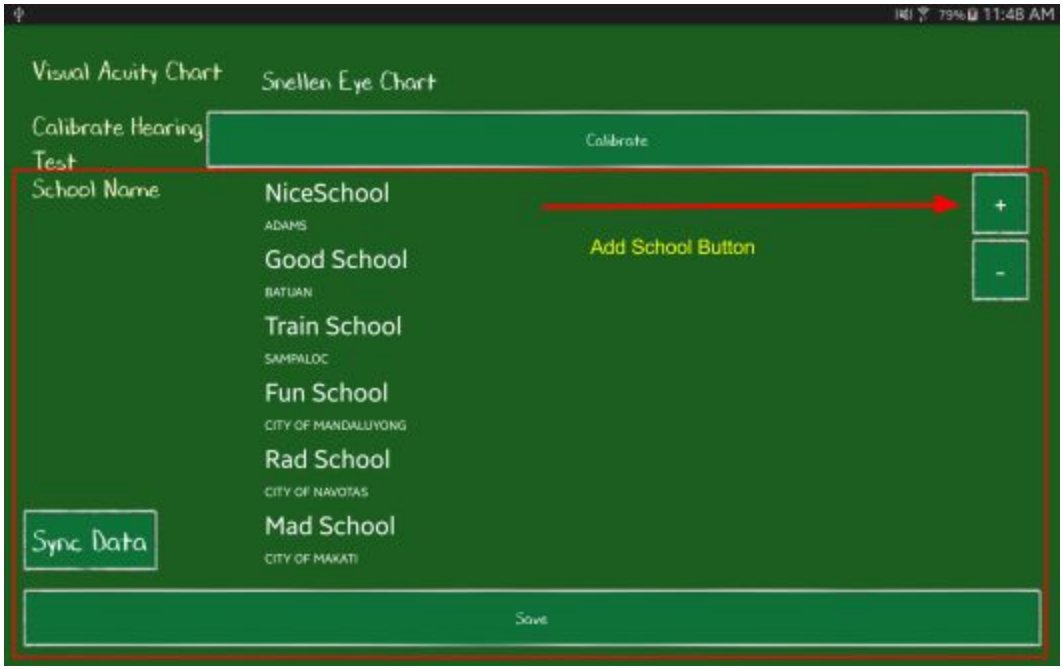
2.1. Opening Settings

To open up the settings activity one has just to press the gear button on the main screen of Geebee as shown below.



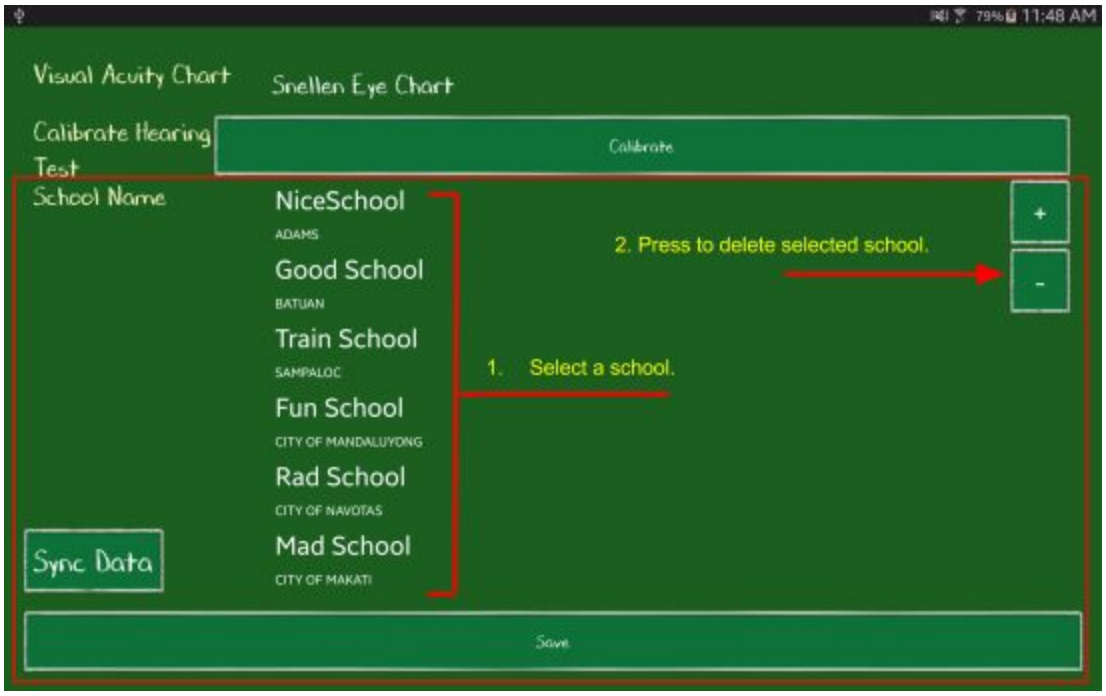
2.2. Selecting / Adding / Removing Schools

To add a school you have to press the plus(+) button in the settings activity. Press the button as shown below.



Then follow the dialog boxes that pops out after pressing. You have to select what region, next button. Then select what province then press next button. Then select what municipality the school resides in, then press next button. Finally, you input the name of the school in the text box dialog then press add. The school should show up as one of the items in the list in the picture above.

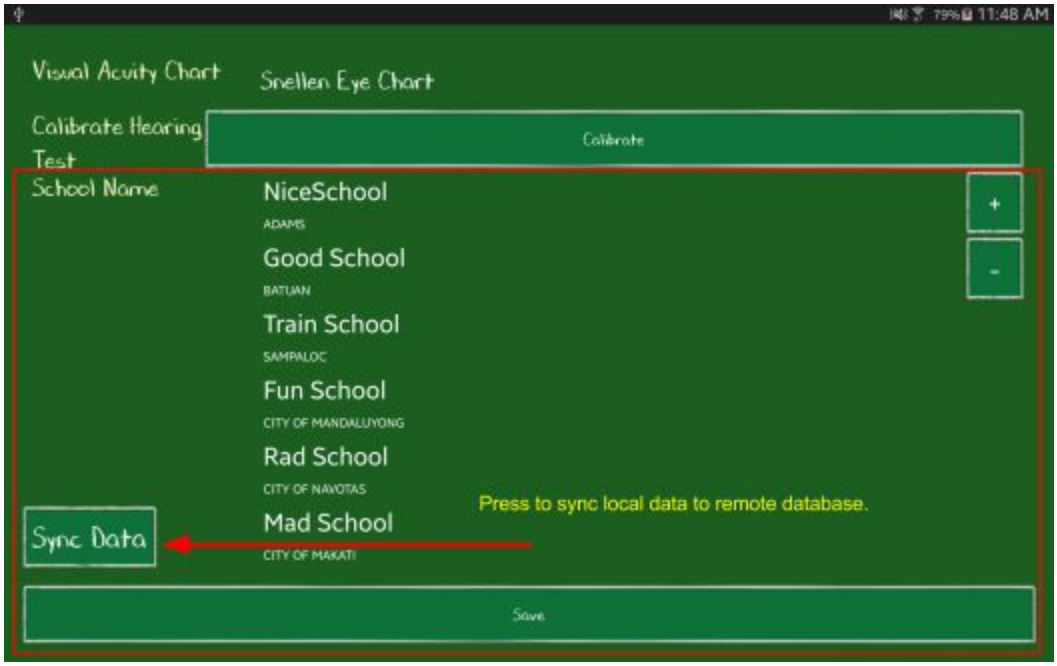
To remove schools, one must simply tap the item the users wants to remove and then press the remove button (-) minus button. As shown below:



Once the user has pressed the minus button (-) after selecting a school to delete the school should be removed from the list.

2.3 Syncing to Remote Database

To sync the collected data of the app, one just has to simply press the ‘Sync Data’ Button on the left most corner of the Activity.



Once the user presses the ‘Sync Data’ Button, two things can happen the sync fails or it pushes through. Once the sync is done, the user is notified via toast that it has completed its upload. If it does not the user will also be notified by a no internet connection error or other errors.

3.0. GEEBEECAPTURE

This application is responsible for computing the height and weight of the person. Limitations of this module are as follows: a reference object specifically a ruler must be used that is sticked to the wall beside the person whose image will be captured. The person must not be blocking the said reference object and must be in upright or perpendicular to the ground.

3.1 Launch GeeBeeCapture

Under the Monitoring Module of GeeBee, the user can choose to launch GeeBeeCapture. To launch it, simply click on the “Use GeeBeeCapture” button. The user will then be redirected to the application GeeBeeCapture.

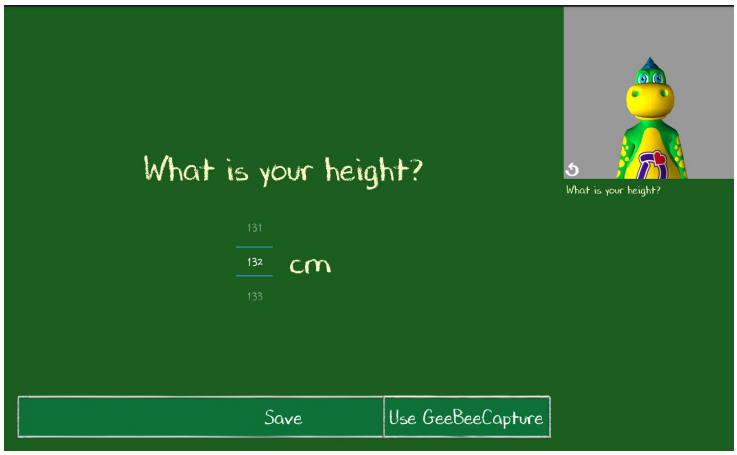


Figure 3.1 GeeBee Height Input

3.2 Load Images to the Tablet

To load the person’s images to the tablet, simply click on “Take Picture” under Front View to take the front view shot of the person. Next, click on “Take Picture” under Side View to take the side view shot of the person.

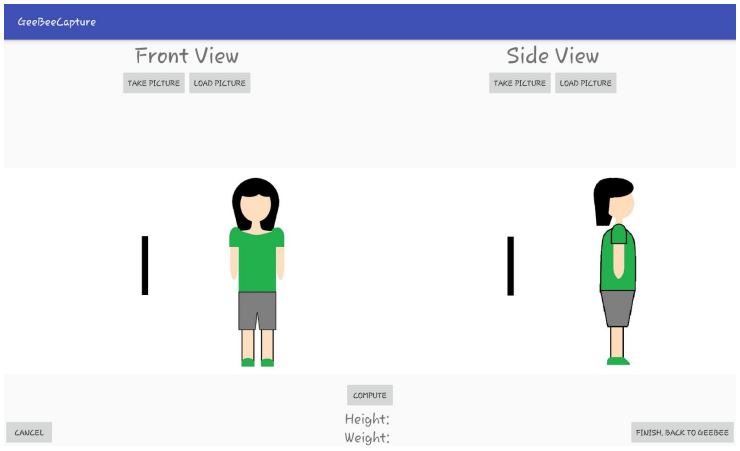


Figure 3.2 GeeBeeCapture

3.3 Compute for Height and Weight

After loading the two images (front view and side view), simply click on the “Compute” button to compute for the height and weight. The computed height and weight will be displayed below the “Compute” button.

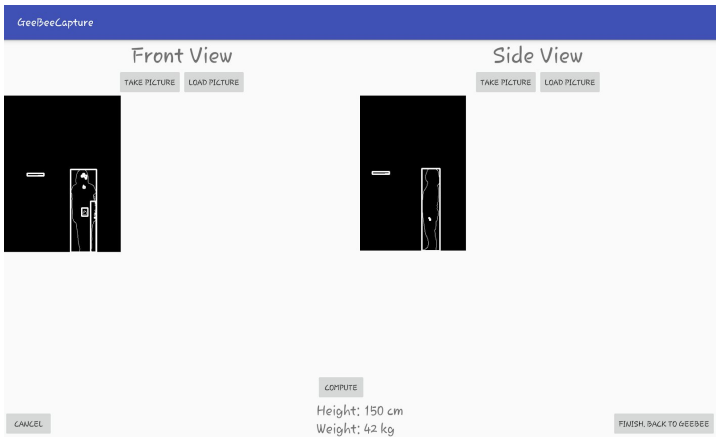


Figure 3.3 GeeBeeCapture Output

4.0 GEEBEEVIEW

GeeBeeView is the mobile application for displaying and visualizing the data collected by GeeBee. After it has been installed and opened, the app will prompt the user to either sign up or login requiring the input of username and password.

The functions of GeeBeeView are download of datasets, generation the visualization for health results of a group of patients, display consultation records, and view transcript of health.

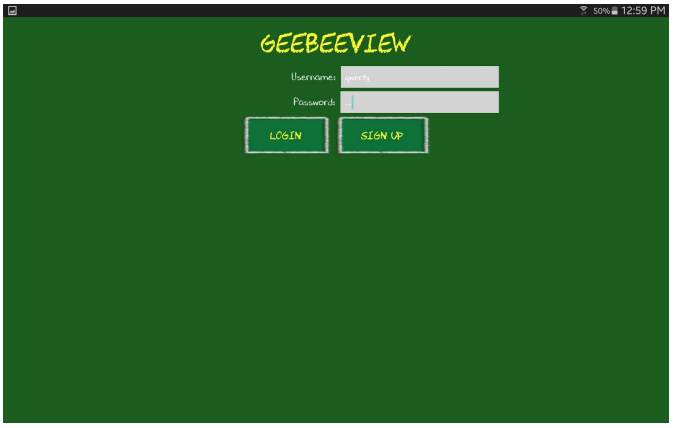


Figure 4.0 GeeBeeView Login

4.1 Download Dataset

After login, the app displays a list of datasets which refer to sets of monitoring records available in the cloud database. This function requires internet connection to view the dataset list and download datasets. To download a dataset, simply tap the button next to the selected dataset. When the button text changes to “view” then the dataset has finished downloading.

Figure 4.1 Download Dataset

4.2 Generate Data Visualization for Group of Patients

To generate data visualization for group of patients, simply tap the “view” button from any downloaded dataset. It generates a chart which displays the collective result of the monitoring tests performed by the patients. The

chart generated is interactive in the sense that the user can add or remove datasets, add or remove filters, change the chart type, and change the health test shown.

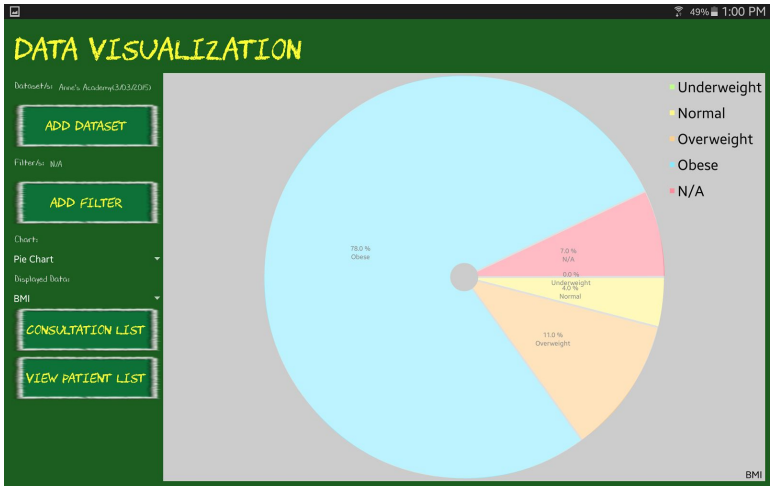


Figure 4.2 Data Visualization

To add a dataset, simply tap the “add dataset” button then a dialog will prompt the user to choose a downloaded dataset to add. Choose a dataset from the dropdown menu then tap “add.” The dataset will be added to the list on the left and the chart will be updated.

To add a filter, simply tap the “add filter” button then a dialog will prompt the user to fill up a form to determine the filter to be added. The filter can either be by age and/or gender. After completing the form, tap “add” to apply filter. The filter/s will be added to the list on the left and the chart will be updated.

To change the chart type, simply tap the dropdown menu then select the desired chart. The chart provided can be either pie, bar, scatter, or bubble chart.

To change health test, simply tap the dropdown menu then select the desired health test. The health tests available are BMI, visual acuity (left or right), color vision, hearing (left or right), gross motor, and fine motor (dominant, non-dominant, hold).

4.3 Display Consultation Records

From the data visualization for group of patients, simply tap the “consultation list” button then the consultation list for that school will be displayed. To display the consultation record, simply tap the “view” button next to the selected consultation. The consultation record will display the patient name, date, and history of present illness generated by GeeBee.

Figure 4.3.1 Consultation List

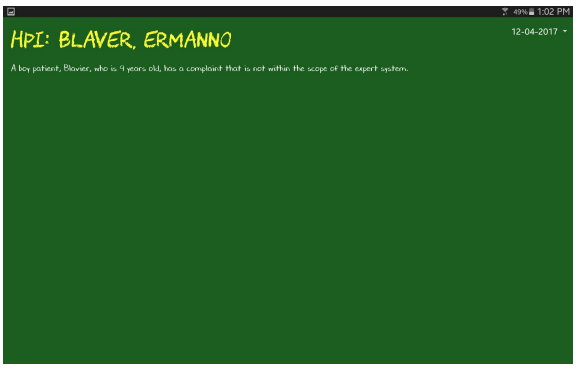


Figure 4.3.2 Consultation Record

4.4 View Transcript of Health

From the data visualization for group of patients, simply tap the “patient list” button then the patient list for that school will be displayed. To view the transcript of health of a patient, simply tap the “view” button next to the selected patient.

The transcript of health is quite similar to the data visualization for group of patients however, it only uses one type of chart and that is a line chart to emphasize the change over time. The health test available for the transcript of health are BMI, height, weight, visual acuity (left or right), color vision, hearing (left or right), gross motor, and fine motor (dominant, non-dominant, hold). Aside for the patient line (holo blue) depicting the patient health test results, there is an additional line (navy blue) for comparing the patient’s results to the average results of other children their age. For the BMI, height, and weight health tests, there are additional lines to be observed. These additional lines are based on the standard growth chart released by WHO (2007).

From the transcript of health, it is also possible to view the consultations of the patient. It also includes viewing the immunization record of the patient simply by tapping the “immunization record” button.

Figure 4.4.1 Patient List

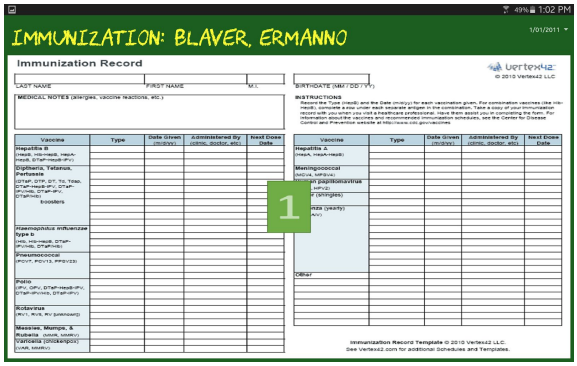


Figure 4.4.2 Immunization Record

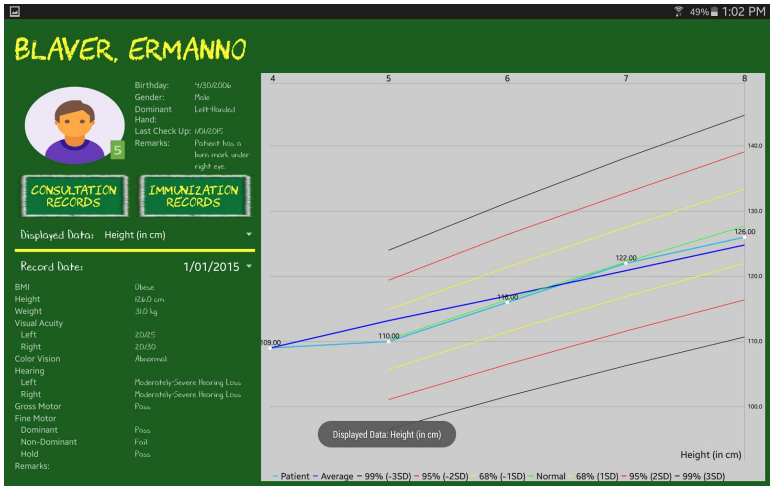


Figure 4.4.3 Transcript of Health