A PROJECT REPORT

ON

Environment News Summarizer Android Application

PUNE INSTITUTE OF COMPUTER TECHNOLOGY AFFILIATED
WITH SAVITRIBAI PHULE PUNE UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR COMPLETION
OF SKILLS DEVELOPMENT LABORATORY UNDER
TE 2015 COMPUTER ENGINEERING COURSE
2019-2020

BY

Sidhee Hande (31266)

Shubhankar Gaikwad (31265)

UNDER THE GUIDANCE OF

Prof. Yogesh Handge

Pune Institute of Computer Technology

Survey No. 27, Near, Trimurti Chowk, Bharati Vidyapeeth Campus, Dhankawadi, Pune, Maharashtra 411043

Abstract

We have made a Climate News Android Application which provides news summaries from around the world. Climate change is a burning issue of today's world and every country around the world is facing its repercussions in different domains. The application provides news in three main categories of: Climate Change, Environment and Geology from six different regions of the world. We have used Android Studio to develop the application and Textrank Algorithm to prepare news summaries. In today's fast paced world, people rarely have the time to go through long articles. Our application provides a concise summary for readers to get a gist of what is happening around the world, particularly in the field of Climate Change.

TABLE OF CONTENTS

CHAPTER 1

Introduction

1.1 What is News?

News is formally defined as “information about current events”. News tells you the happenings around the world that you should know as a citizen, a human, and as a responsible member of society. It keeps you updated and helps you acquire great political, economical, and social understanding by reading diverse articles, on various topics.

1.2 Environment News

Environment is the surroundings or conditions in which a person, animal or plant lives or operates. At a time when the environment is deteriorating with each passing day, it is extremely important for us to analyse, and understand the extent of this deterioration so as to do our best to reverse the situation. Hence, through our project we aim to enable readers to learn about the latest happenings in the world of Environment primarily in the fields of Climate Change and Geology.

Climate Change is one of the most burning issues of today’s world. From shifting weather patterns that threaten food production, to rising sea levels that increase the risk of catastrophic flooding, the impacts of climate change are global in scope and unprecedented in scale. Without drastic action today, adapting to these impacts in the future will be more difficult and costly.

Geology is the study of the Earth, the materials of which it is made, the structure of those materials, and the processes acting upon them. It includes the study of organisms that have inhabited our planet. An important part of geology is the study of how Earth's materials, structures, processes and organisms have changed over time.

1.3 News Summaries

Although most people understand the grave danger our environment is in, very few have the time to keep themselves well informed about it. Our fast paced lives give us very little time to read an entire article, let alone an entire newspaper. Hence, we have made News Summaries of latest news articles that help the readers get a gist of the news in a few lines and gives them the option of reading it further directly from the website if they wish to.

CHAPTER 2

Survey

- We were inspired to create something akin to the Inshorts App which provides 60 words summaries of the latest news. Other than this app, there is another app called Way2News, that brings short summarised nuggets of news in local languages. However, our app is different from these two since we have narrowed down on providing News related to the environment and climate change.
- We have used the TextRank Algorithm to generate news summaries. TextRank is an algorithm based on PageRank, which is often used in keyword extraction and text summarization.
- PageRank (PR) is an algorithm used to calculate the weight for web pages. We can take all web pages as a directed graph. In this graph, a node is a web page. If web page A has the link to web page B, it can be represented as a directed edge from A to B.After we construct the whole graph, we can assign weights for web pages by the following formula.

$$S(V_i) = (1-d) + d * \sum_{j \in In(v_i)} \frac{1}{|Out(V_j)|} S(V_j)$$

- S(Vi) - the weight of webpage i
- d - damping factor, in case of no outgoing links
- In(Vi) - inbound links of i, which is a set
- Out(Vj) - outgoing links of j, which is a set
- |Out(Vj)| - the number of outbound links

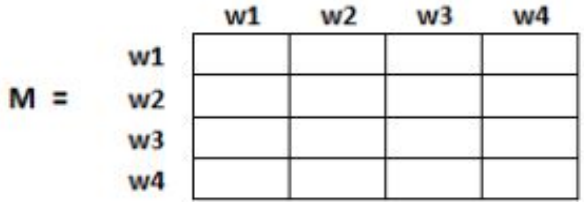
Suppose we have 4 web pages — w1, w2, w3, and w4. These pages contain links pointing to one another. Some pages might have no link – these are called dangling pages.

webpage	links
w1	[w4, w2]
w2	[w3, w1]
w3	[ ]
w4	[w1]

- Web page w1 has links directing to w2 and w4
- W2 has links for w3 and w1
- W4 has links only for the web page w1
- W3 has no links and hence it will be called a dangling page

In order to rank these pages, we would have to compute a score called the PageRank score. This score is the probability of a user visiting that page.

To capture the probabilities of users navigating from one page to another, we will create a square matrix M, having n rows and n columns, where n is the number of web pages.



Each element of this matrix denotes the probability of a user transitioning from one web page to another. For example, the highlighted cell below contains the probability of transition from w1 to w2.

The initialization of the probabilities is explained in the steps below:

1. Probability of going from page i to j, i.e., M[i][j], is initialized with 1/(number of unique links in web page wi)
2. If there is no link between the page i and j, then the probability will be initialized with 0

3. If a user has landed on a dangling page, then it is assumed that he is equally likely to transition to any page. Hence, M[i][j] will be initialized with 1/(number of web pages)

Hence, in our case, the matrix M will be initialized as follows:

M =

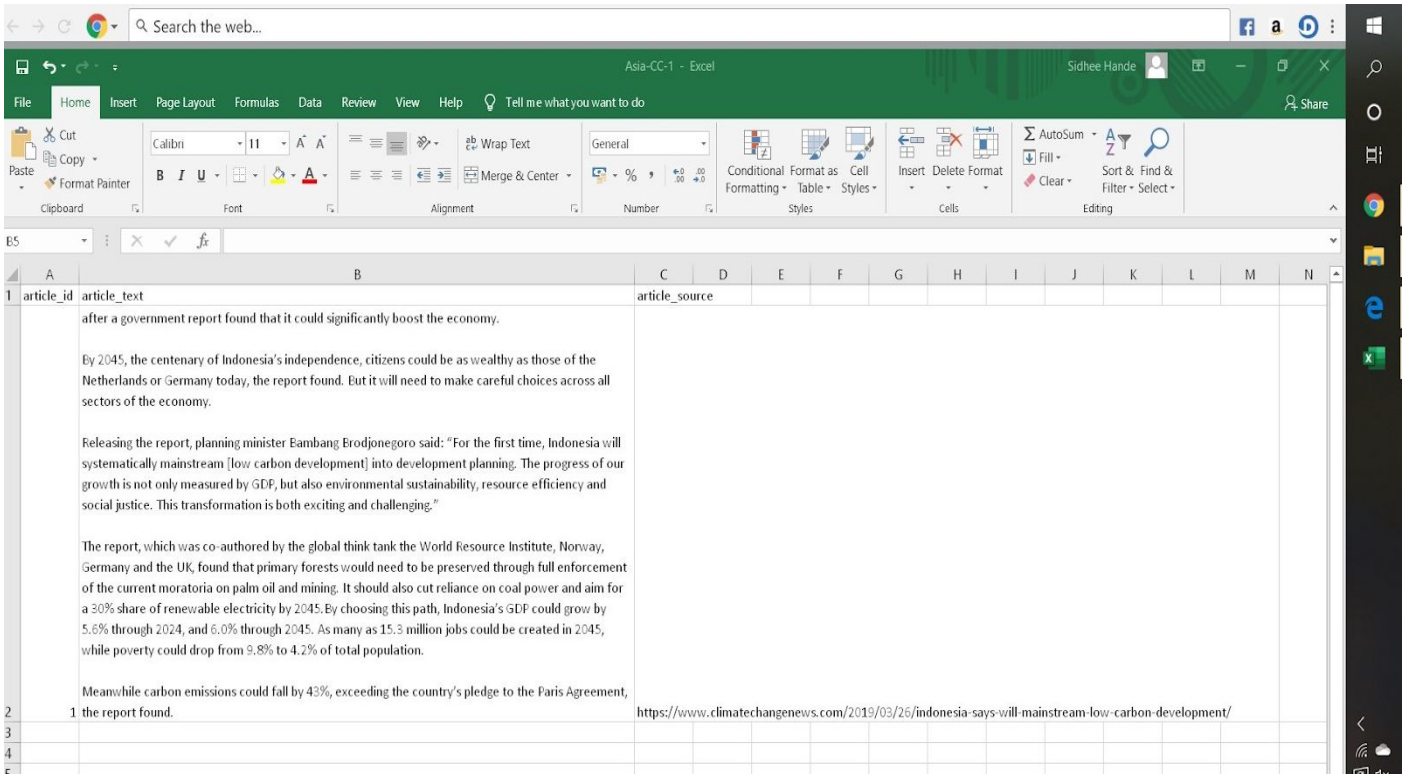
	w1	w2	w3	w4
w1	0	0.5	0	0.5
w2	0.5	0	0.5	0
w3	0.25	0.25	0.25	0.25
w4	1	0	0	0

Finally, the values in this matrix will be updated in an iterative fashion to arrive at the web page rankings.

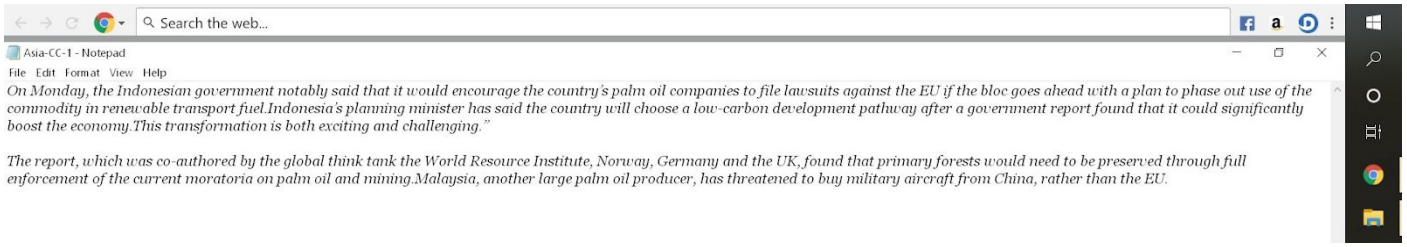
CHAPTER 3

Requirements Gathering and Analysis

In order to generate News Summaries, we had to create datasets consisting of news articles. We made Excel files with article_id, article_text and article_source as columns. The link to the news website was stored in the article_source column and the text of the article was stored in article_text. Here is a screenshot of a sample Excel file.



We stored these datasets in .csv format and read them in a python code implementation of the TextRank Algorithm. The generated summaries were stored in a text file. Here is a screenshot of a sample generated summary.



CHAPTER 4

Problem Statement

Our problem statement is creating an Android Application which shows news summaries from around the world in the Environment domain.

We have covered the following 6 main regions of the world:

1. Asia
2. Africa
3. Americas
4. Europe
5. Middle-East
6. Pacific

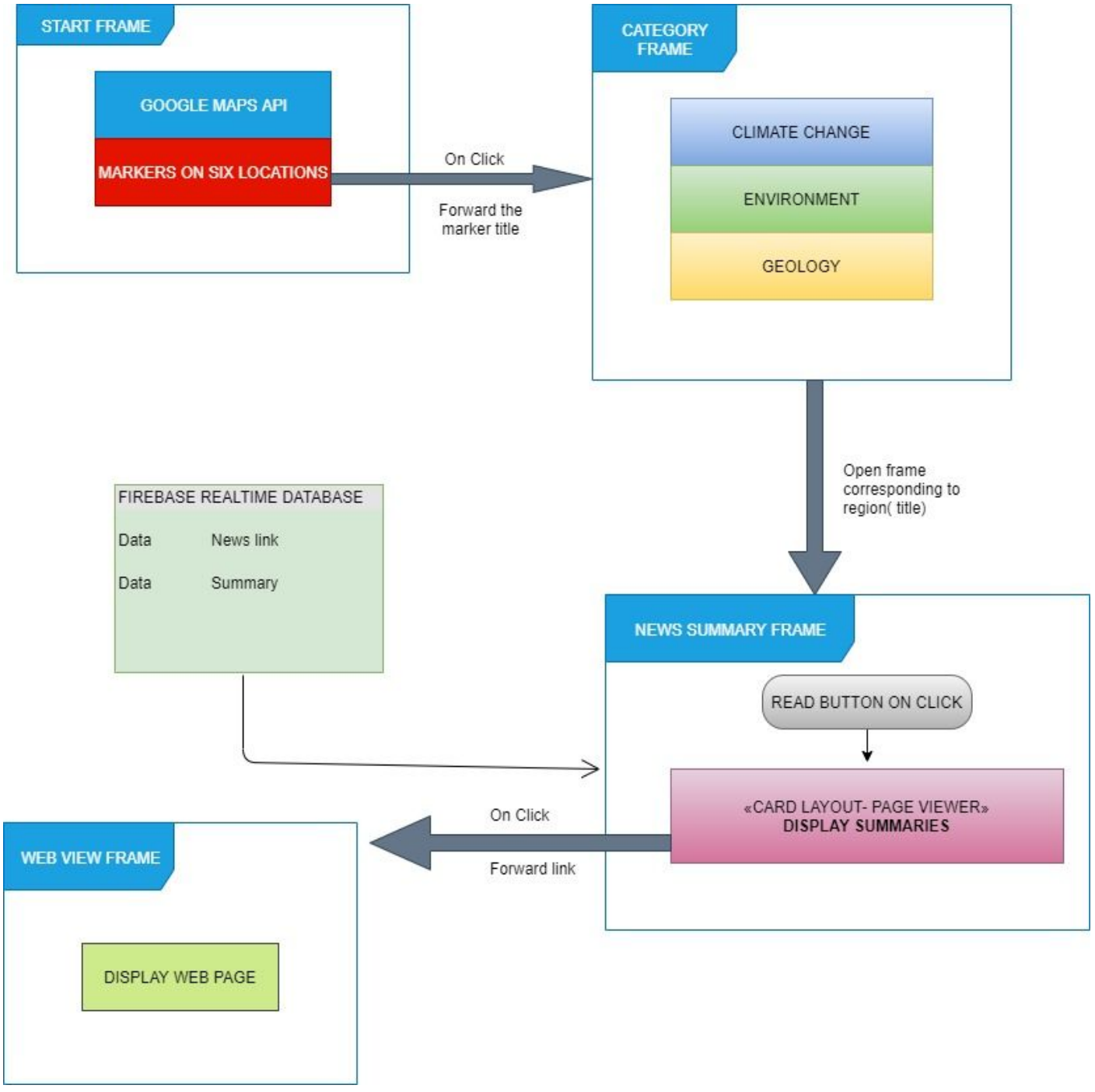
We have covered 3 main topics of

1. Environment
2. Climate Change
3. Geology

We have generated 3 different news summaries in each domain. Thus,every region has a total of 9 different summaries, which have been generated using the popular NLP algorithm:TextRank.

CHAPTER 5

Architecture Diagram



CHAPTER 6

Software and Hardware Requirements

1. **Android Studio for Windows:**

   RAM: 3 GM RAM Minimum, 8 GB RAM recommended; plus 1 GB for the Android Emulator

   OS: Windows 7/8/10 32 or 64 bit

   Hard Disk Space: 2 GB minimum (500 MB for IDE and 1.5 GB for Android SDK); 4 GB recommended.

   Screen Resolution: 1280*800 (minimum)

2. **Google maps API**
3. **Firebase realtime database**
4. **Java Development Kit 1.8**
5. **Text Rank Algorithm Resources:**

   Numpy and Pandas Python Libraries

   GloVe Word Embeddings to convert sentences into vector representations

   Natural Language ToolKit

   Jupyter Notebook

CHAPTER 7

Algorithms and APIs Used

Text Summarisation is an important part of Natural Language Processing and it has several applications. There are two types of summarisation algorithms.

1. Extractive Summarisation

   In this approach, we select the X most representative sentences that best cover the whole information expressed by the original text.

2. Abstractive Summarisation

   In this approach, we basically build a summary of the text, in the way a human would build one. We pick ideas from several paragraphs or sentences, build readable sentences and present them in a concise form. It requires a good understanding of deep learning.

We have used one of the most popular algorithms of Extractive Summarisation: TextRank. The foundation of the TextRank Algorithm lies in the PageRank Algorithm that was described earlier. PageRank is used for the ranking of webpages and is popular for its use in performing Google Searches. TextRank is similar to PageRank except that it forms a network of sentences instead of web pages. The probability of going from sentence A to sentence B is equal to the similarity of the 2 sentences.

❑ What is TextRank?

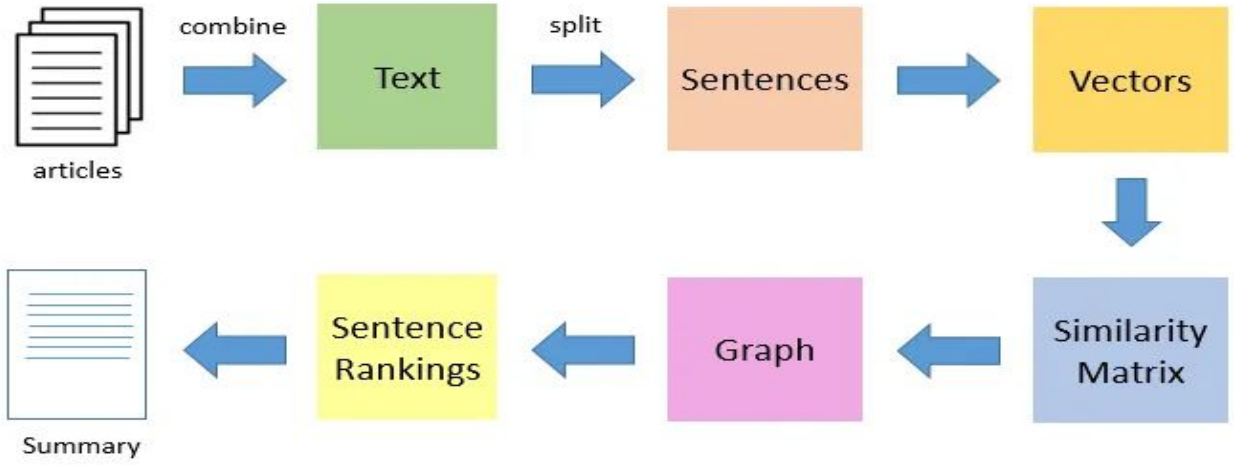
TextRank is a Natural Language Processing Algorithm that is used for Extractive Text Summarisation. It finds how similar each sentence is to all other sentences in the text. The most important sentence is the one that is most similar to all the others. This similarity determines how accurate the summary is. The similarity function should be oriented to the semantic of the sentence. TextRank is an unsupervised method. Hence, no training is necessary. It is language independent, and so it can be used on any language, not only English.

❑ Working of TextRank

These are the steps for its implementation:

- Concatenate all the text contained in the articles.
- Split the text into individual sentences.
- Find vector representation (word embeddings) for each and every sentence.
- Similarities between sentence vectors are then calculated and stored in a matrix.
- The similarity matrix is then converted into a graph, with sentences as vertices and similarity scores as edges, for sentence rank calculation.
- Finally, a certain number of top-ranked sentences form the final summary.

The accuracy of TextRank largely depends on the similarity function used to compute the similarity between two sentences. Cosine similarity based on a bag of words approach can work well.



❑ Text Preprocessing

It is always a good practice to make textual data as noise-free as possible. We have performed some basic preprocessing operations to clean the text such as:

1. Removing punctuation, numbers and special characters
2. Making alphabets lower case.
3. Removing stopwords(commonly used words in a language – is, am, the, of, in, etc.)

❑ Cosine Similarity Function

Cosine similarity is a measure of similarity between two non-zero vectors of an inner product space that measures the cosine of the angle between them. The cosine of 0° is 1, and it is less than 1 for any angle in the interval (0,π] radians. It is thus a judgment of orientation and not magnitude: two vectors with the same orientation have a cosine similarity of 1, two vectors oriented at 90° relative to each other have a similarity of 0, and two vectors diametrically opposed have a similarity of -1, independent of their magnitude. One advantage of cosine similarity is its low-complexity, especially for sparse vectors: only the non-zero dimensions need to be considered.

Google Maps Api

With the Maps SDK for Android, you can add maps based on Google Maps data to your application. The API automatically handles access to Google Maps servers, data downloading, map display, and response to map gestures. You can also use API calls to add markers, polygons, and overlays to a basic map, and to change the user's view of a particular map area. These objects provide additional information for map locations, and allow user interaction with the map. The API allows you to add these graphics to a map:

- Icons anchored to specific positions on the map (Markers).
- Sets of line segments (Polylines).
- Enclosed segments (Polygons).
- Bitmap graphics anchored to specific positions on the map (Ground Overlays).
- Sets of images which are displayed on top of the base map tiles (Tile Overlays).
-

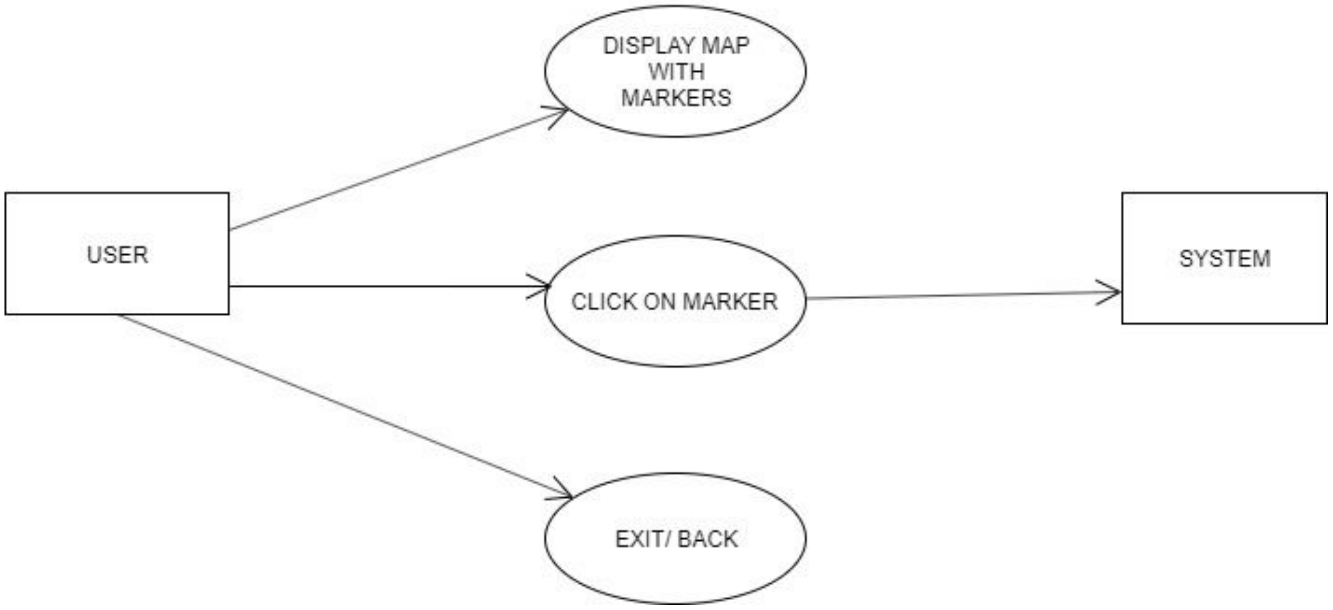
Firebase Realtime Database

Store and sync data with our NoSQL cloud database. Data is synced across all clients in real-time, and remains available when your app goes offline. The Firebase Realtime Database is a cloud-hosted database. Data is stored as JSON and synchronized in realtime to every connected client. When you build cross-platform apps with our iOS, Android, and JavaScript SDKs, all of your clients share one Realtime Database instance and automatically receive updates with the newest data.

CHAPTER 8

High Level Design

FRAME 1- MAPS API (START)

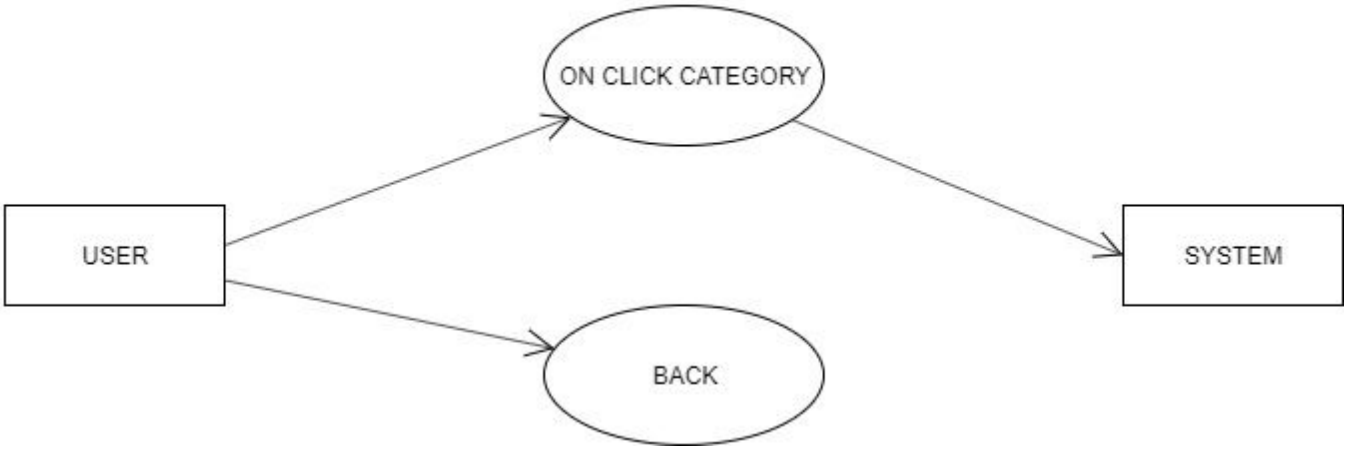


When the user starts the app, the app loads the Google Maps api with markers in it.

When user clicks on a marker, the app sends map title data to the next frame and opens a new frame.

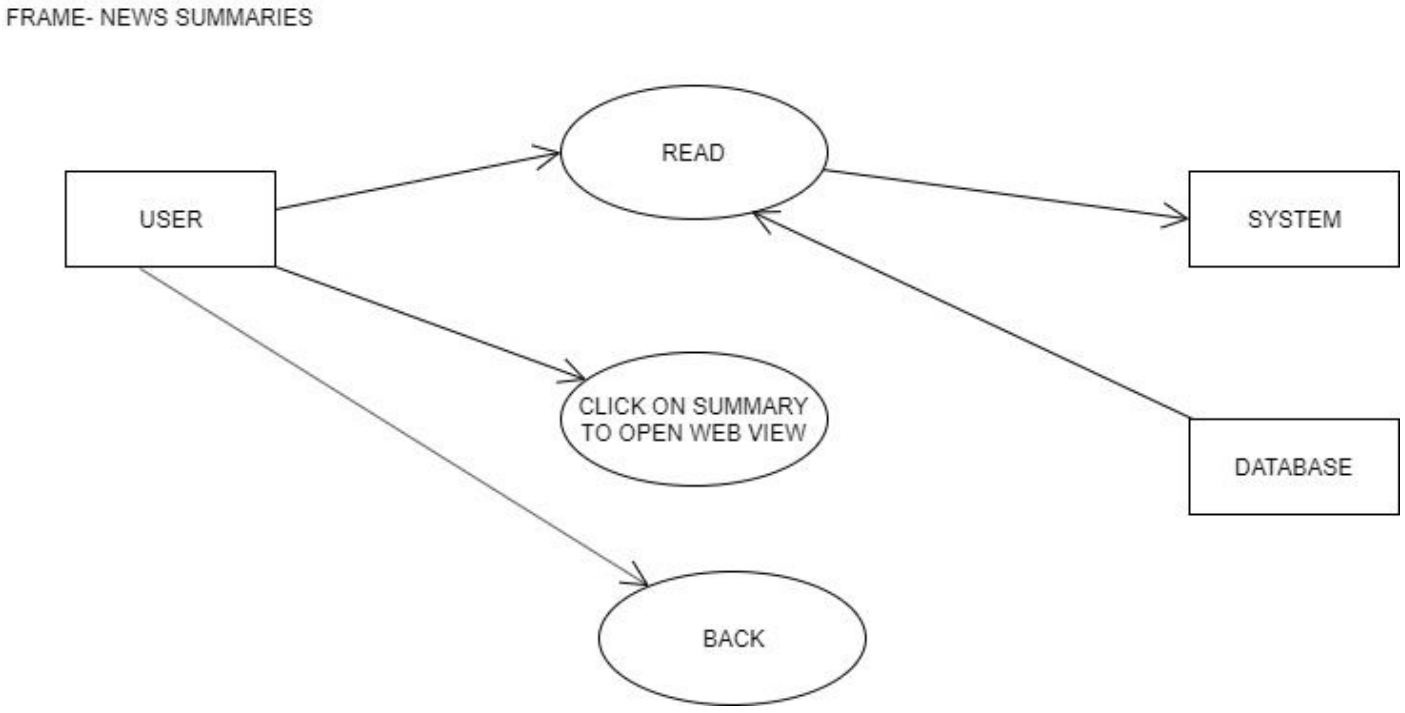
If user presses back or exit, app terminates.

FRAME- CATEGORY



When the user clicks on a category, the app transfers the marker data to next frame and opens new frame.

On pressing back, previous frame pops up.



When user presses READ button, the app fetches specific JSON data stored in firebase realtime database and displays the data in card layouts placed in the pageviewer of the current frame.

The user can read the summary and on clicking, new frame displaying webview of article gets opened.

On pressing back, previous frame pops up.

CHAPTER 9

Test Cases

1)Title: Installing the app on android phone

Description: Install app from Android Studio in PC to mobile phone

Precondition: Drivers installed on PC to connect the phone

Assumption: Mobile has internet connectivity, google-play services, USB debugging enabled, in developer mode.

Test Steps:

1. Connect the device using USB port
2. Select the device in Android studio
3. Build and run the app
4. Open the app in phone

Expected Result: App opens without any glitches

2)Title: User interaction with Google Maps API

Description: Open the app and interact with Maps API

Precondition: Internet connectivity and successfully installed app

Assumption: Mobile has Google-play services installed, Google Maps API key is valid.

Test Steps:

1. Open the app
2. Scroll through the screen to see the whole map

3. Use zoom in and out features

Expected Result: App runs without any glitches

3)Title: User interaction with markers

Description: User clicks on markers placed on Map.

Precondition: Internet connectivity and successfully installed app

Assumption: Mobile has Google-play services installed, Google Maps API key is valid.

Test Steps:

1.Open the app.

2. Scroll through the screen to see the whole map

3. Press on the marker over a region to read the news about that region.

4. Forwards marker data to next frame.

Expected Result: Map API runs without any bugs and opens new frame.

4)Title: Category frame interaction

Description: User clicks on one of the category buttons.

Precondition: Marker data forwarded

Assumption: Internet connectivity, app working without crashing

Test Steps:

1. Click on the button
2. Wait for next frame to open

Expected Result: App opens next frame depending upon button clicked and the data from previous frame.

5)Title: User presses the READ button

Description: User clicks READ button on new frame opened.

Precondition: Internet connectivity and successfully installed app

Assumption: Mobile has Google-play services installed, Firebase connection successful.

Test Steps:

1. Press READ button
2. Wait for app to fetch data from realtime database.

Expected Result: App reads the suitable JSON data depending on metadata from previous frames.

6)Title: User reads summary and clicks on card view

Description: User is able to read and scroll through summaries and open new web view if he/she wants to read the whole article.

Precondition: Internet connectivity and successfully installed app

Assumption: Firebase data is successfully fetched.

Test Steps:

1. Swipe the screen to see different summaries
2. Scroll through the text area to read summary.
3. Click on summary to open web view

Expected Result: User is able to read summary and view article.

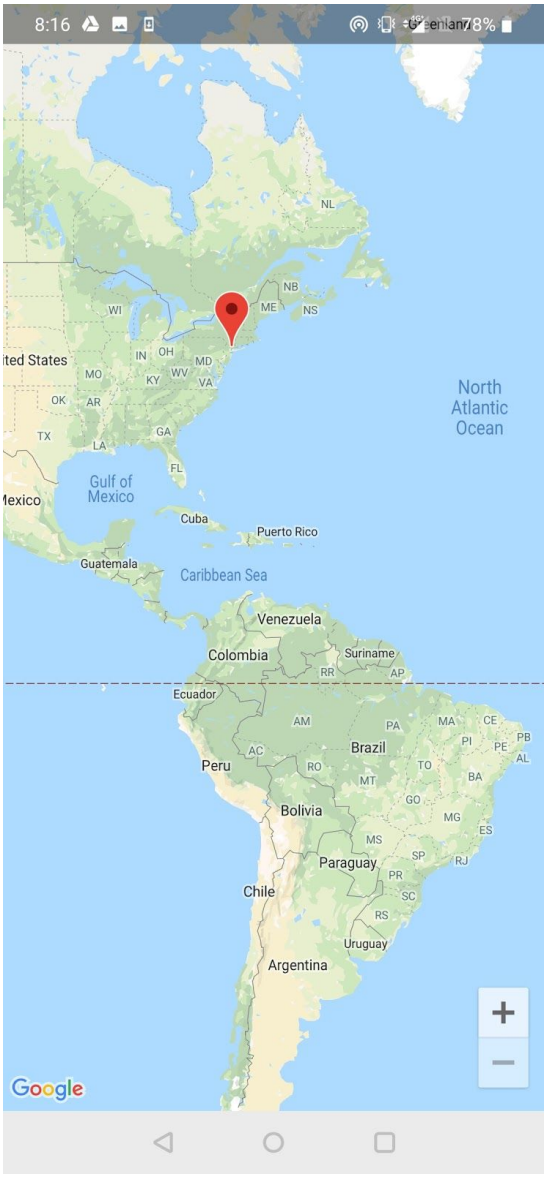
CHAPTER 10

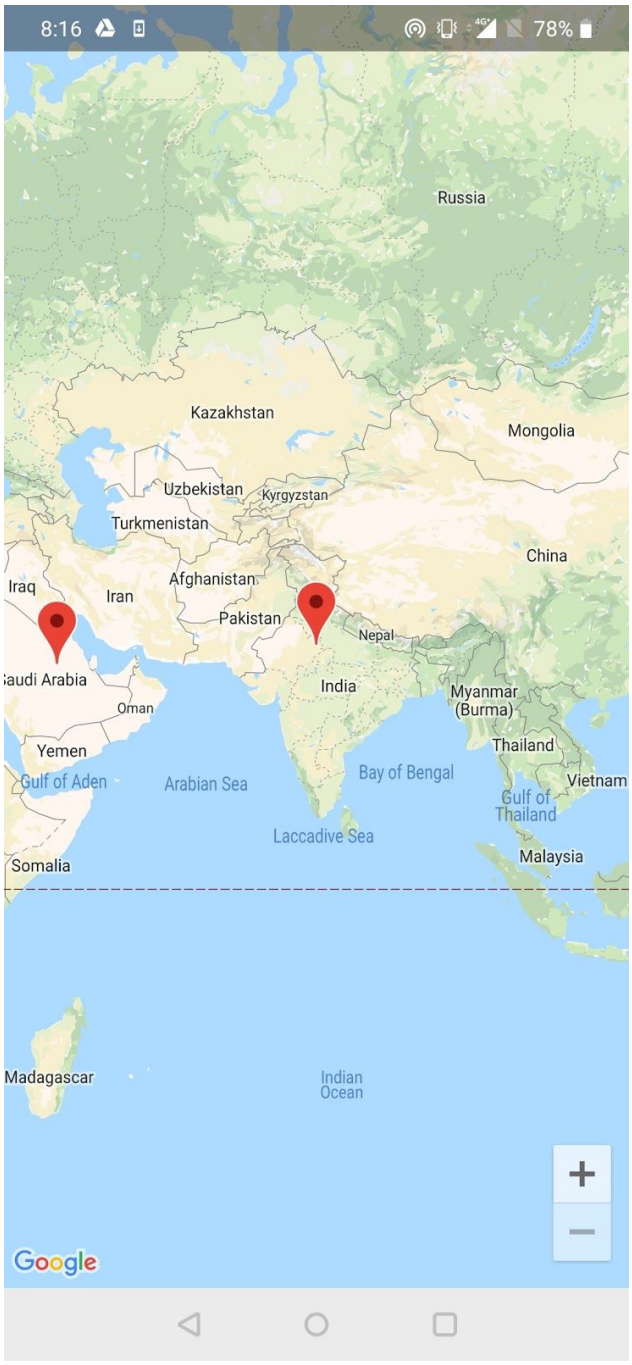
Results

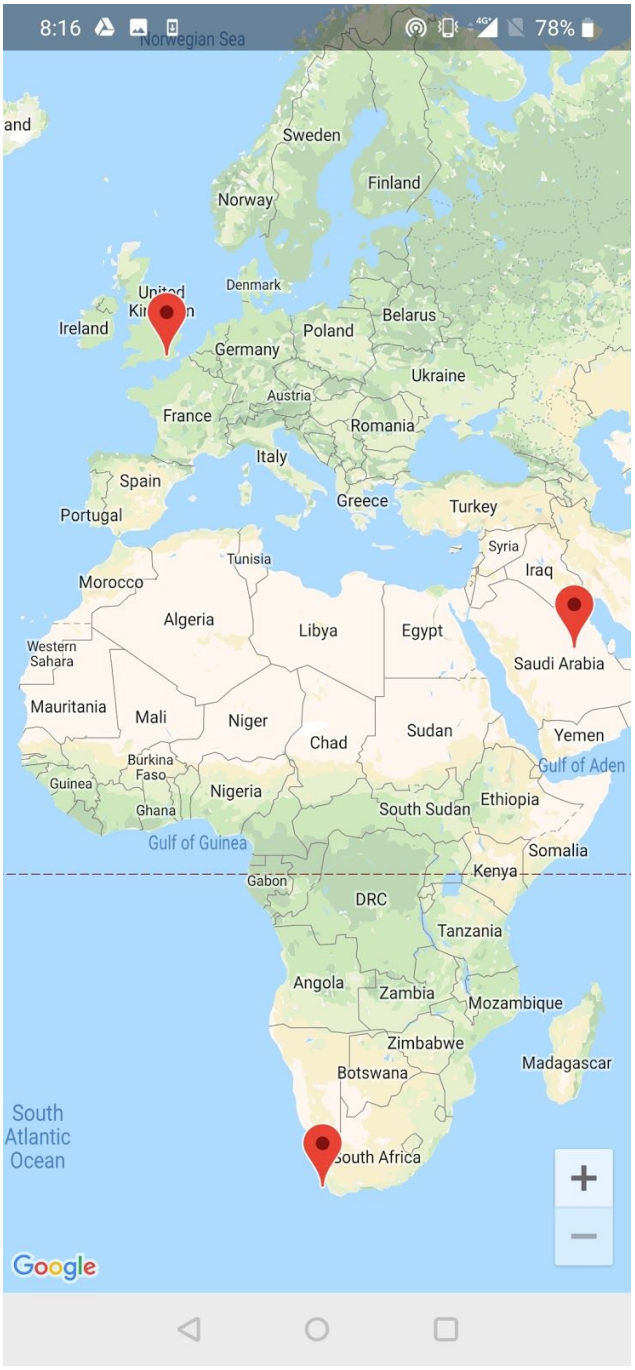
1. Start screen/ First frame-

Google Maps API with six markers for six locations set.

Markers are clickable.




8:16
78%
Russia
Kazakhstan
Mongolia
Uzbekistan
Kyrgyzstan
Turkmenistan
China
Iraq
Afghanistan
Iran
Pakistan
Nepal
India
Saudi Arabia
Oman
Yemen
Myanmar (Burma)
Thailand
Vietnam
Gulf of Aden
Arabian Sea
Bay of Bengal
Gulf of Thailand
Laccadive Sea
Malaysia
Somalia
Madagascar
Indian Ocean
Google


8:16
78%
Norwegian Sea
Sweden
Finland
Norway
Denmark
Ireland
Poland
Belarus
Germany
Ukraine
Austria
France
Romania
Italy
Spain
Portugal
Greece
Turkey
Syria
Iraq
Tunisia
Morocco
Algeria
Libya
Egypt
Saudi Arabia
Western Sahara
Mauritania
Mali
Niger
Chad
Sudan
Yemen
Gulf of Aden
Burkina Faso
Guinea
Nigeria
Ethiopia
Ghana
South Sudan
Gulf of Guinea
Somalia
Kenya
Gabon
DRC
Tanzania
Angola
Zambia
Mozambique
Zimbabwe
Botswana
Madagascar
South Atlantic Ocean
Google

2. On clicking on a specific marker

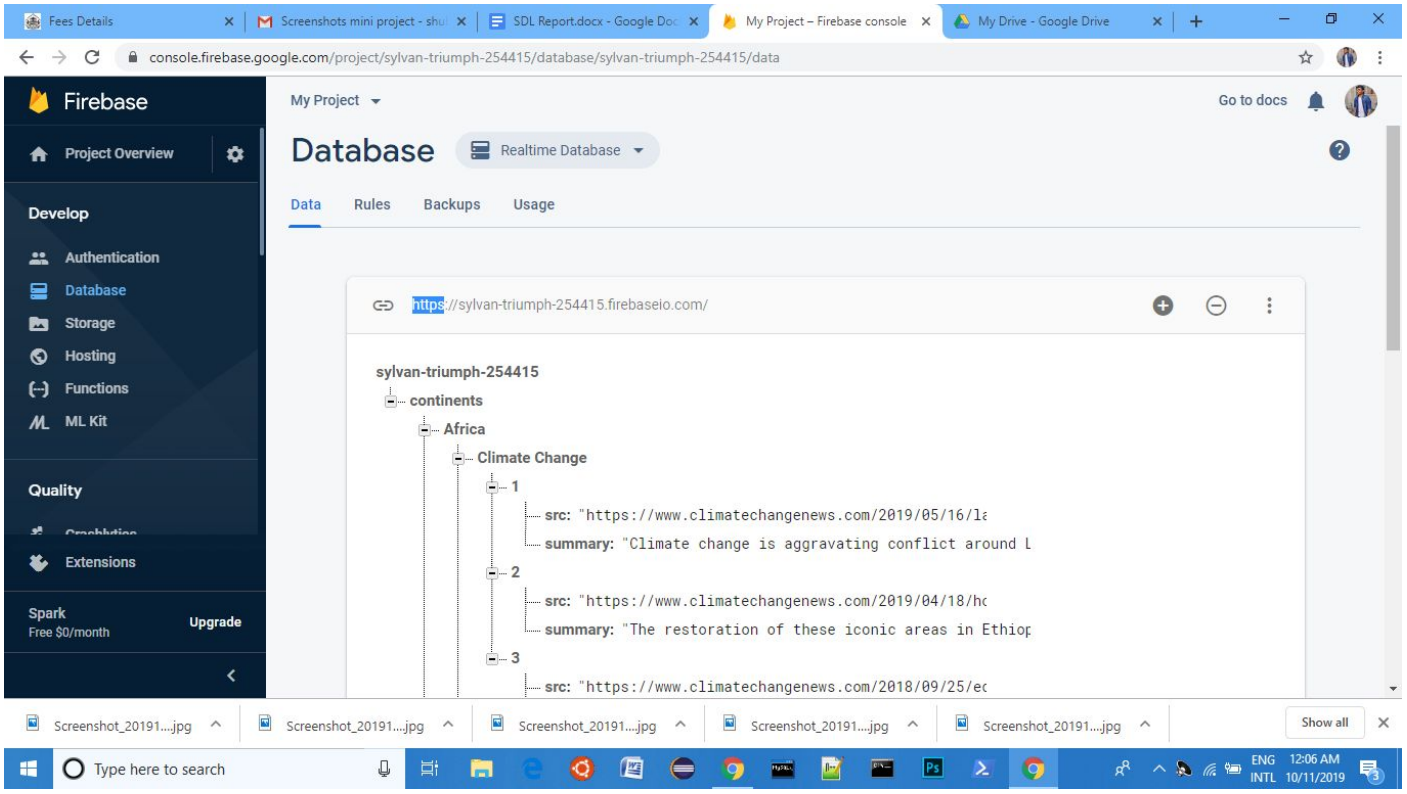
The title stored at the marker is sent to the next frame.

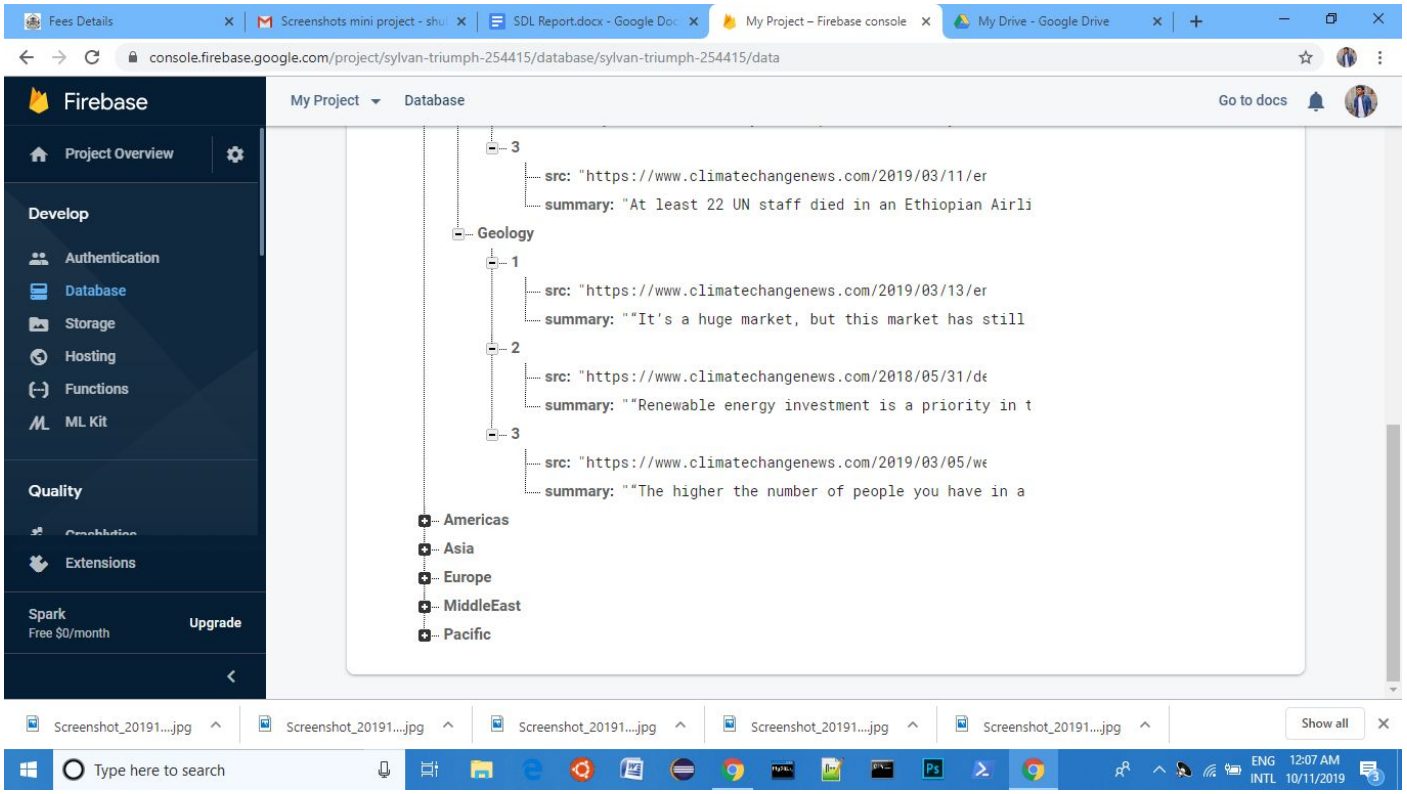
3. Category frame

User can select from three categories.

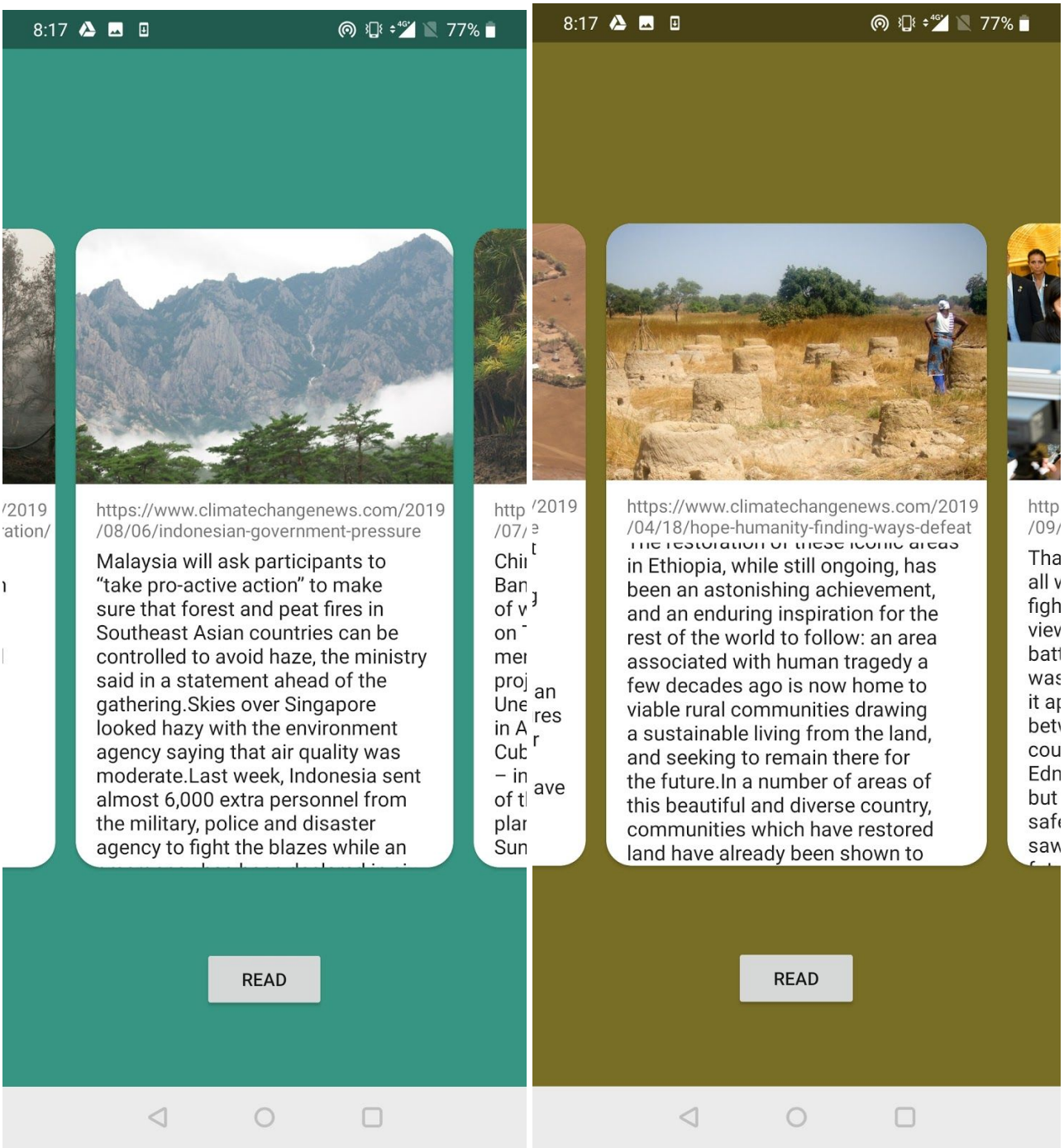
4. **Forwards continent name to next frame.**

   On read button clicked, fetches data from database.

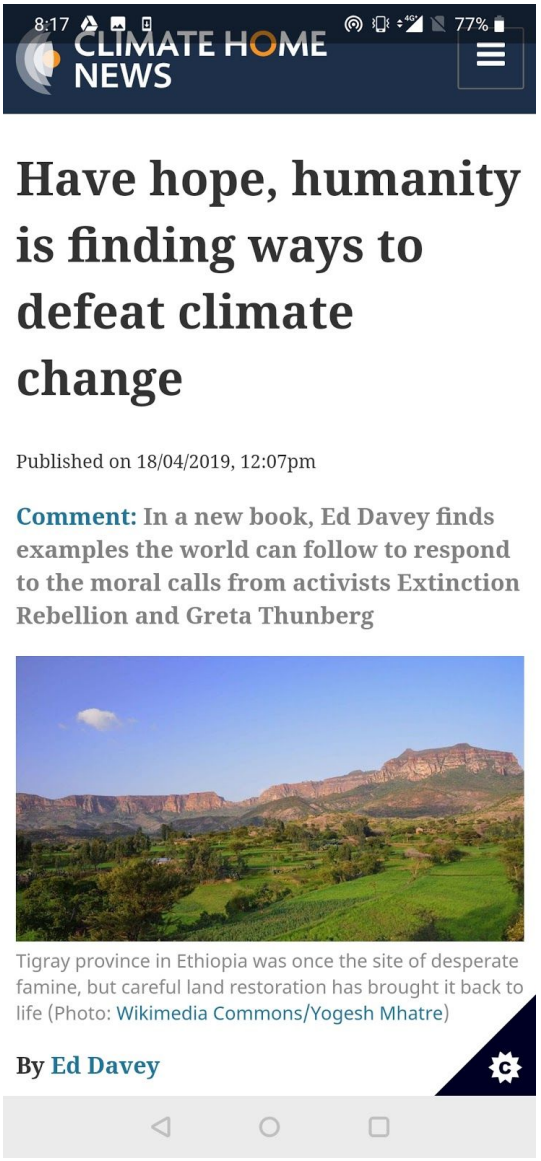

Fees Details
Screenshots mini project - shu
SDL Report.docx - Google Doc
My Project – Firebase console
My Drive - Google Drive
console.firebase.google.com/project/sylvan-triumph-254415/database/sylvan-triumph-254415/data
Firebase
My Project
Go to docs
Project Overview
Develop
Authentication
Database
Storage
Hosting
Functions
ML Kit
Quality
Extensions
Spark
Free $0/month
Upgrade
Database
Realtime Database
Data
Rules
Backups
Usage
https://sylvan-triumph-254415.firebaseio.com/
sylvan-triumph-254415
continents
Africa
Climate Change
1
src: "https://www.climatechangenews.com/2019/05/16/l
summary: "Climate change is aggravating conflict around L
2
src: "https://www.climatechangenews.com/2019/04/18/h
summary: "The restoration of these iconic areas in Ethiop
3
src: "https://www.climatechangenews.com/2018/09/25/e
Screenshot_20191....jpg
Show all
Type here to search
ENG
INTL
12:06 AM
10/11/2019


Fees Details
Screenshots mini project - shu
SDL Report.docx - Google Doc
My Project – Firebase console
My Drive - Google Drive
console.firebase.google.com/project/sylvan-triumph-254415/database/sylvan-triumph-254415/data
Firebase
My Project
Database
Go to docs
Project Overview
Develop
Authentication
Database
Storage
Hosting
Functions
ML Kit
Quality
Extensions
Spark
Free $0/month
Upgrade
3
src: "https://www.climatechangenews.com/2019/03/11/er
summary: "At least 22 UN staff died in an Ethiopian Airli
Geology
1
src: "https://www.climatechangenews.com/2019/03/13/er
summary: ""It's a huge market, but this market has still
2
src: "https://www.climatechangenews.com/2018/05/31/de
summary: ""Renewable energy investment is a priority in t
3
src: "https://www.climatechangenews.com/2019/03/05/we
summary: ""The higher the number of people you have in a
Americas
Asia
Europe
MiddleEast
Pacific
Screenshot_20191....jpg
Show all
Type here to search
ENG
INTL
12:07 AM
10/11/2019

5. Display the data from database to the current frame in card view and page viewer layout.



6. **On clicking on summary, web view opens to read the entire news article.**



CHAPTER 11

Conclusion

News forms an integral part of many people's daily routine and hence this application will prove to be very useful for them. Since the text files are stored in Firebase, the summaries can be changed dynamically. Our summaries are 4-5 lines extracted from the original article which may be very long. The summaries are comprehensible, concise and meet their purpose of giving the reader a gist of the news article. Since the news datasets were collected in September, we have used the latest news from September.

Environment News is one of the most relevant and deeply concerning news of our time and staying updated with its latest developments should be of utmost importance. Our application enables users to do the same.

CHAPTER 12

Future Scope

Every application can have some improvements and extensions.

- ➢ Our application uses Extractive Summarisation techniques to generate meaningful summaries. However, Abstractive Summarisation techniques have been proved to generate more accurate and meaningful summaries since they use features from the Deep Learning Realm. Hence, as a future scope of our application we can employ some Abstractive algorithms to generate news summaries.
- ➢ Alternatively, we can also use BM25/BM25+ approach to generate more accurate summaries with TextRank Algorithm itself.
- ➢ We have covered news in the domains of “Environment”, “Climate Change” and “Geology”. This can be extended to many more domains such as “Pollution”, “Global Warming”, etc.
- ➢ We have covered 6 different regions of the world and can extend this to all countries to make this a truly wholesome, global project.

CHAPTER 13

References

1. Joshi, P. (2019). *Introduction to Text Summarization using the TextRank Algorithm*. [online] Analytics Vidhya. Available at: https://www.analyticsvidhya.com/blog/2018/11/introduction-text-summarization-textrank-python/ [Accessed 28 Aug. 2019].
2. Current Affairs, Current Affairs 2017. (2019). *Tech firm Way2online launches free app for summarised news | Current Affairs, Current Affairs 2019*. [online] Available at: https://www.news.civilserviceindia.com/tech-firm-way2online-launches-free-news-app/ [Accessed 10 Oct. 2019].
3. NLP-FOR-HACKERS. (2019). *TextRank for Text Summarization - NLP-FOR-HACKERS*. [online] Available at: https://nlpforhackers.io/textrank-text-summarization/ [Accessed 10 Oct. 2019].
4. Lee, C. (2018). *Use TextRank to Extract Most Important Sentences in Article*. [online] Medium. Available at: https://medium.com/the-artificial-impostor/use-textrank-to-extract-most-important-sentences-in-article-b8efc7e70b4 [Accessed 10 Oct. 2019].
5. Nethala, A. (2017). *How to implement WebView in your Android apps*. [online] Medium. Available at: https://medium.com/android-hunger/how-to-implement-webview-in-your-android-apps-3cf45ff2286 [Accessed 23 Sept. 2019].
6. Bogotobogo.com. (2019). *Open Source: 2018 - Java/C++/Python/BigData/Android/*. [online] Available at: https://www.bogotobogo.com/ [Accessed 23 Sep. 2019].
7. Khan, B. (2019). Firebase Storage Example - Uploading and Retrieving Files. [online] Simplified Coding. Available at: https://www.simplifiedcoding.net/firebase-storage-example/ [Accessed 29 Sep. 2019].
8. Firebase. (2019). *FirebaseDatabase | Firebase*. [online] Available at: https://firebase.google.com/docs/reference/android/com/google/firebase/database/FirebaseDatabase.html#getInstance() [Accessed 26 Sep. 2019].
9. Bogotobogo.com. (2019). *Android 4 - Google Map View - 2018*. [online] Available at: https://www.bogotobogo

10..com/Android/android17MapView.php [Accessed 21 Sep. 2019].
11. Visual-paradigm.com. (2019). *What is Use Case Diagram?*. [online] Available at: https://www.visual-paradigm.com/guide/uml-unified-modeling-language/what-is-use-case-diagram/ [Accessed 10 Oct. 2019].
12. Jambhulkar P. (2019). *Computer Revolution (www.comrevo.com)*. [online] Comrevo.com. Available at: https://www.comrevo.com/?m=1 [Accessed 30 Sep. 2019].
13. Google Developers. (2019). *Overview | Maps SDK for Android | Google Developers*. [online] Available at: https://developers.google.com/maps/documentation/android-sdk/intro [Accessed 10 Oct. 2019].

News Article References:

Americas

1. Climate change

A)https://www.scientificamerican.com/article/spread-of-deadly-mosquito-borne-disease-may-be-linked-to-climate-change

B) https://www.google.com/amp/s/phys.org/news/2019-09-climate-emigration-central-america.amp

C) https://unfccc.int/news/latin-american-caribbean-climate-week-calls-for-urgent-ambitious-action

2. Environment

A)https://environmentamerica.org/news/ame/statement-un-report-finds-state-our-ocean-demands-action

B)https://www.google.com/amp/s/amp.theguardian.com/environment/2019/oct/02/activists-set-sail-across-the-atlantic-to-chile-to-demand-curbs-on-flying

C) https://www.scitecheuropa.eu/illegal-wildlife-trade-in-the-americas/97479/

3. Geology

A)https://www.usgs.gov/news/usgs-estimates-214-trillion-cubic-feet-natural-gas-appalachian-basin-formations

B)https://www.usgs.gov/news/usgs-install-new-volcano-early-detection-and-monitoring-stations-mount-hood-improving-early

C)https://earthobservatory.nasa.gov/images/145680/rifting-and-calving-on-the-amery-ice-shelf

Europe

1. Climate change

A)https://www.google.com/amp/s/www.truthdig.com/articles/climate-change-is-already-hitting-europe-harder-than-anyone-expected/%3famp

B) https://www.eea.europa.eu/highlights/climate-change-threatens-future-of

C)https://www.euronews.com/2019/09/25/italian-roads-and-mountain-huts-evacuated-as-glacier-on-mont-blanc-risks-collapse

2. Environment

A)https://www.google.com/amp/s/amp.theguardian.com/world/2019/oct/04/environment-groups-offer-30k-reward-to-identify-wolf-naya-killer

B)https://www.independent.co.uk/environment/uk-wildlife-species-extinct-state-nature-report-a9138276.html

C)https://www.independent.co.uk/environment/scientists-meat-eating-climate-crisis-vegetarian-vegan-mayors-a9131926.html

3. Geology

A)https://www.sciencemag.org/news/2019/09/geologists-uncover-history-lost-continent-buried-beneath-europe

B)https://www.egu.eu/news/506/new-study-fracking-prompts-global-spike-in-atmospheric-methane/

C)https://www.bbc.com/news/uk-scotland-north-east-orkney-shetland-49825133?intlink_from_url=https://www.bbc.co.uk/news/topics/cdgv9plkeemt/geology&link_location=live-reporting-story

Middle east

1. Climate change

A) https://www.weforum.org/agenda/2019/04/middle-east-front-lines-climate-change-mena/

B)https://www.weforum.org/agenda/2019/01/the-arab-worlds-best-weapon-against-climate-change-its-youth/

C)https://www.weforum.org/agenda/2019/04/to-fight-climate-change-the-arab-world-needs-to-come-together/

2. Environment

A)https://www.independent.co.uk/voices/middle-east-environment-water-wars-sudan-egypt-un-journalism-a8858771.html?amp

B)https://www.middleeasteye.net/news/activists-turkey-demonstrate-call-unite-behind-science-climate-change

C) https://www.middleeasteye.net/news/iran-makes-further-arrests-environmentalists

3. Geology

A)https://oilprice.com/Latest-Energy-News/World-News/Saudi-Arabia-Sets-Up-New-320-Million-Renewables-Fund.htl

B)https://www.oilandgasmiddleeast.com/article-18175-lukoil-continues-exploration-at-block-10-appraisal-of-eridu-field-in-iraq

C)https://www.oilandgasmiddleeast.com/products-services/35231-petrofac-opens-office-in-kuwait-city

Pacific

1. Climate change

A)https://www.google.com/amp/s/www.aljazeera.com/amp/news/2019/08/pacific-leaders-chide-australia-climate-change-190816061914690.html

B)https://www.climatechangenews.com/2019/08/13/australia-seeks-water-climate-declaration-pacific-summit/

C) https://news.un.org/en/story/2019/09/1047792

2. Environment

A)https://www.google.com/amp/s/amp.theguardian.com/environment/2019/sep/28/return-of-native-tiny-partula-snail-key-south-pacific-wildlife

B)https://www.sprep.org/news/intergovernmental-panel-on-climate-change-ipcc-special-report-on-oceans-and-the-cryosphere

C) https://www.sprep.org/news/low-carbon-development-shared-the-pacific-island-way

3. Geology

A)https://www.japantimes.co.jp/opinion/2019/09/29/commentary/world-commentary/saving-pacific-islanders-geoengineering/#.XZDYSR7hUzQ

B) https://www.pacificenvironment.org/more-ships-more-risks-protecting-the-arctic/

C)https://mobile.abc.net.au/news/2019-08-14/cricket-legend-shane-warne-lends-name-to-jurassic-era-volcanoes/11411934?pfmredir=sm

Africa

1. Climate Change

A)https://www.climatechangenews.com/2019/05/16/lake-chad-not-shrinking-climate-fuelling-terror-groups-report/

B)https://www.climatechangenews.com/2019/04/18/hope-humanity-finding-ways-defeat-climate-change/

C)https://www.climatechangenews.com/2018/09/25/edna-molewa-fought-unity-climate-change-dies-aged-61/

2. Environment

A)https://www.climatechangenews.com/2019/03/28/extreme-weather-impacted-62-million-people-last-year-says-wmo/

B)https://www.climatechangenews.com/2019/04/17/rwandan-farmers-lead-tree-planting-effort-meet-rising-wood-demand/

C)https://www.climatechangenews.com/2019/03/11/environment-community-mourns-victims-ethiopian-airlines-plane-crash/

3. Geology

A)https://www.climatechangenews.com/2019/03/13/energy-oil-majors-turn-rural-africa-grab-worlds-next-billion-customers/

B)https://www.climatechangenews.com/2018/05/31/desert-solar-partnership-aims-bring-power-250-million-africans/

C)https://www.climatechangenews.com/2019/03/05/weeds-flourish-fish-decline-lake-victorias-deadest-corner/

Asia

1. Climate Change

A)https://www.climatechangenews.com/2019/03/26/indonesia-says-will-mainstream-low-carbon-development/

B)https://www.climatechangenews.com/2019/01/17/two-koreas-build-green-cooperation/

C)https://www.climatechangenews.com/2019/07/24/car-boom-brings-gridlock-misery-green-happy-bhutan/

2. Environment

A)https://www.climatechangenews.com/2019/01/17/two-koreas-build-green-cooperation/

B)https://www.climatechangenews.com/2019/08/06/indonesian-government-pressure-stamp-toxic-haze/

C)https://www.climatechangenews.com/2019/07/05/china-scrubs-coal-projects-world-heritage-danger-decision/

3. Geology

A)https://westbridgfordwire.com/dinosaur-display-that-brought-chinese-fossils-to-nottingham-wins-heritage-award/

B)https://scoopjunction.com/geology-and-seismic-software-market-growth-rate-demands-status-and-application-forecast-to-2024/412578/

C)https://www.scmp.com/news/china/diplomacy/article/3030015/chinese-survey-ship-leaves-vanguard-bank-and-heads-artificial