Project Relevium

Relevium Team

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Arab Academy for Science, Technology & Maritime Transport

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Outline

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Introduction

Project Function

Relevium is a mobile application with built-in assistant which leads to smoother and easier user experience. The application mainly focus on the user's safety through collecting real time data only in the disastrous situations eg: (Hurricanes, earthquakes, etc).

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Project Function

- To help the user to safely escape or ping user location to notify the authorities for rescue, or it can be used to access list of the nearby shelters and potential danger zones to be away from.

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- To help the user to safely escape or ping user location to notify the authorities for rescue, or it can be used to access list of the nearby shelters and potential danger zones to be away from.
- The app also can be used as messaging application with the nearby users during the disaster to request nearby help or even a pickup if your car got jammed.

Project Scope

- A natural disaster is a sudden event that causes widespread destruction, lots of collateral damage or loss of life, brought about by forces other than the acts of human beings.

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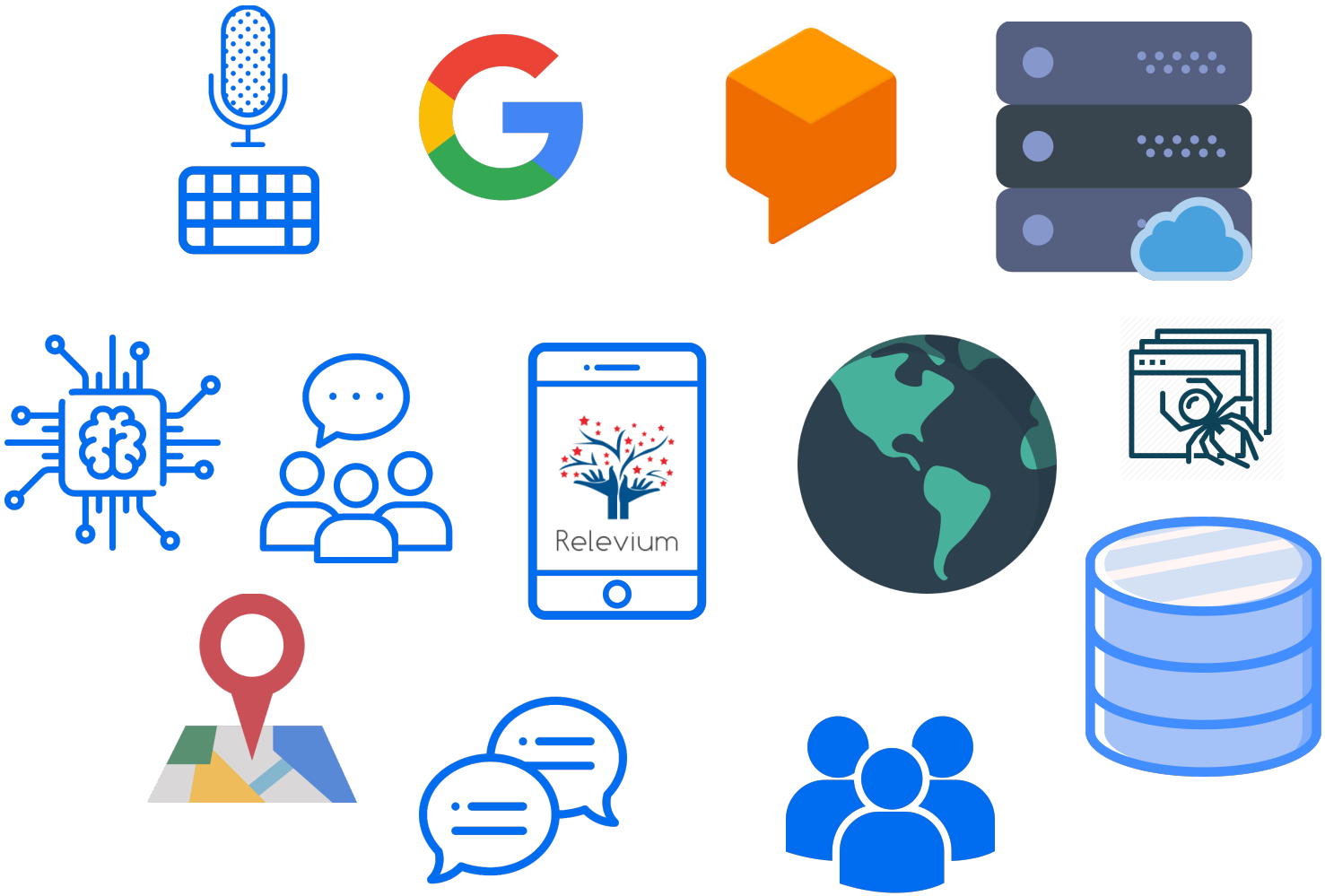
- A natural disaster is a sudden event that causes widespread destruction, lots of collateral damage or loss of life, brought about by forces other than the acts of human beings.
- The project aims to develop mobile application that enhance the communication between people who are in danger using chatting groups, and managing disaster by recommending an evacuation plan in addition supporting assistant.

Architectural View



Project Objective

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- We also provide individuals, families, and their neighbors with the information they need to stay safe anywhere, anytime.

Related Work

Emergency & Disaster Survival Guide

Emergency preparedness & Disaster Survival Guide is paid mobile application that cover almost all the how to survive a disastrous situation with simple illustrations and written guides.

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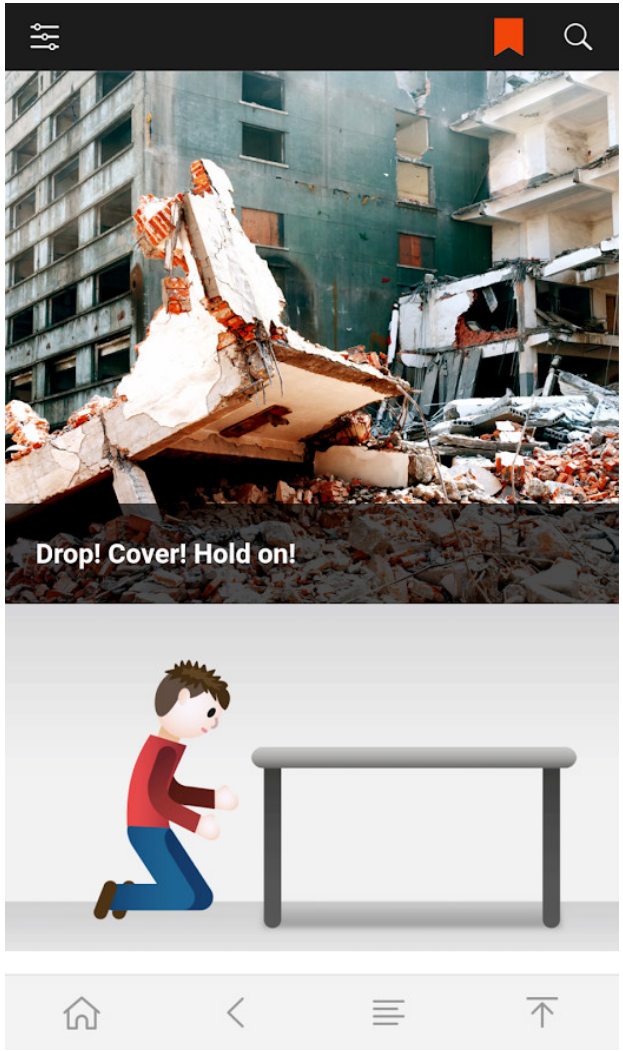
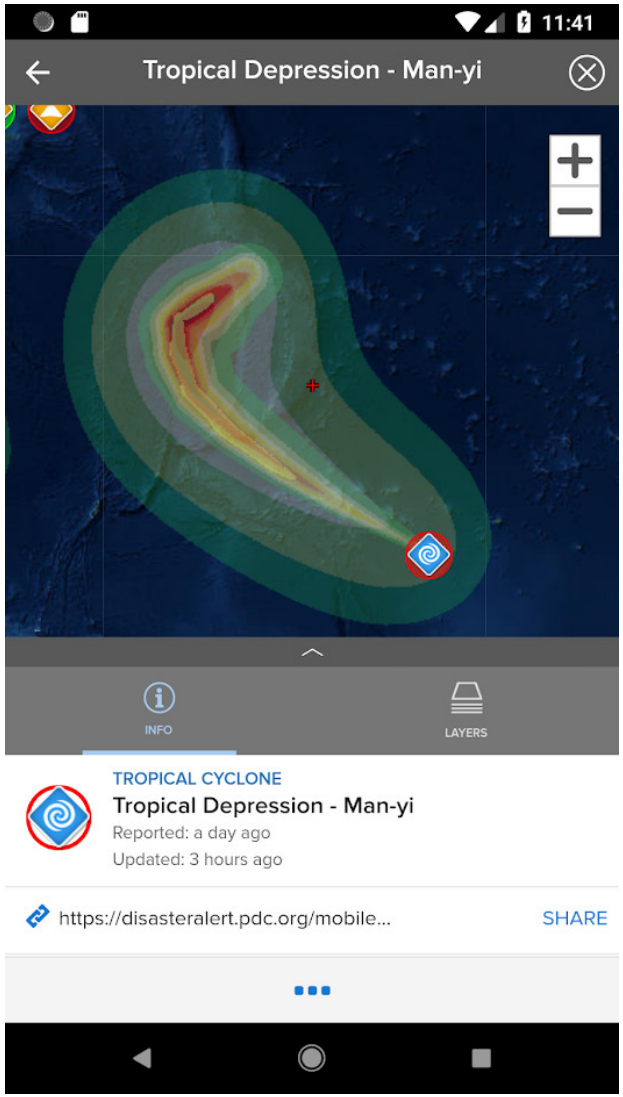


Related Work

Disaster Alert™

Disaster Alert is a free, mobile app that provides individuals, families, and their loved ones with the information they need to stay safe anywhere in the world. Disaster Alert offers near real-time updates about 18 different types of active hazards as they are unfolding around the globe.



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Requirements

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Relevium Watchful Smart Helper

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- Communicate with the application through phone's built-in assistant. We create intents in the agent that map user input to responses. In each intent, we define examples of user requests that can trigger the intent, what to extract from the request, and how to respond.

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- Communicate with the application through phone's built-in assistant. We create intents in the agent that map user input to responses. In each intent, we define examples of user requests that can trigger the intent, what to extract from the request, and how to respond.
- Generally, an intent represents one dialog turn within the conversation. The agent would match that input to its corresponding intent and return the response defined within that intent. The agents response usually prompts users for another utterance, which the agent will attempt to match another intent, and the conversation continues.

Relevium Watchful Smart Helper

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- Relevium project uses Watchful Smart Helper as a advanced way to communicate with user. When the user log-in user will receive a welcome intent from pre-populated text responses.

Voice Recognition

Relevium project uses voice recognition as an alternative way to carry out the communication with the user, we use it because of sometimes the user in critical situations wont be able to use the typing method to use the Relevium mobile app, it also enhance the communication and offer the user a variety of different possible ways to use them as input method or interaction ways with our application.

Network of mobiles during the disaster (MANET)

Stands for "Mobile Ad-hoc Network"

Connect users in the same geographical area using a wireless mesh network (WMN).

A MANET is a type of ad-hoc network that can change locations and configure itself on the fly. Because MANETS are mobile, they use wireless connections to connect to various networks. This can be a standard Wi-Fi connection, or another medium, such as a cellular or satellite transmission.

Network of mobiles during the disaster (MANET)

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- The usability of this feature in Relevium project will occur when the infrastructure of the cellular network or WLAN isnt available or accessible, so we can make the users who have Relevium mobile app communicate with their mobiles using Mobile ad-hoc network (MANET) to share knowledge and current situation thats happening at each person side, and to help society collaborate and quick help each other during disasters.

Paramedic User

- One of the most important features During the disaster. When the user register to our application user will be asked to fill a form to prove that the user a paramedic or not (optional), and if user fill this field, then user required to prove that by a picture for work identity or any document prove that user have the right to work with a paramedic degree.

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Paramedic User

- There may be conditions under which the paramedic user will decide to get away or to be there to help others, there are no conditions for user to follow, he has full freedom to choose what he wants to do by helping others or escape in case of danger.

Shelter users & Highlight danger zones

When our application recognizes the user in probable disaster zone then application will disseminate visual and audio disaster warning and evacuation guideline including shortest path of shelter on the map of the application.

Share user's location & information

Relevium can tell user when a friend is nearby.

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- it lets you "wave" at them and gives you the option to send a message if they wave back.
- it even let you tell your friends where you are and give them directions to your location.
- It will also let you pick a special friend (like a family member, spouse or love interest, for example) to share your location with long-term.

Evacuation Plan

- Find shortest safe path to evacuate and override traffic rules if necessary.

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Evacuation Plan

- Find shortest safe path to evacuate and override traffic rules if necessary.
- The country may lack effective disaster preparedness system to confront natural disasters. Timely disaster warning and evacuation guideline can save lives. In addition, a tourists may face difficulties in finding safe area or shelter prior to the occurrence of natural disasters.

Early alerting system

Predict hazardous environments and alert users.
The system leverage a third-party Disaster Management Server (DMS), mobile device with our application installed on it and Connect DMS to get updates about disaster (tsunami, cyclone or flood) to get automatic notification of upcoming disaster.

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Web crawler to collect data from websites

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A Web crawler is an Internet bot which helps in Web indexing. They crawl one page at a time through a website until all pages have been indexed. Web crawlers help in collecting information about a website and the links related to them, and also help in validating the HTML code and hyperlinks.

Also Known As

A Web crawler is also known as a Web spider, automatic indexer or simply crawler.

Web crawler to collect data from websites

- Web crawlers collect information such the URL of the website, the meta tag information,the Web page content, the links in the web page and the destinations leading from those links, the web page title and any other relevant information.

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- Web crawlers collect information such the URL of the website, the meta tag information,the Web page content, the links in the web page and the destinations leading from those links, the web page title and any other relevant information.
- They keep track of the URLs which have already been downloaded to avoid downloading the same page again. A combination of policies such as re-visit policy, selection policy, parallelization policy and politeness policy determine the behavior of the Web crawler.

Safety Requirements

User agrees by using this system that under no circumstances or any theories of liability under international or civil, common or statutory law including but not limited to strict liability, negligence or other tort theories or contract, patent or copyright laws, will the system be liable for damages of any kind occurring from the use of this system or any information, goods or services obtained on this website including direct, indirect, consequential, incidental, or punitive damages (even if the system has been advised of the possibility of such damages), to the fullest extent permitted by law.

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Security Requirements

- This application will have users credentials like (mobile numbers, addresses ..etc) So it must have encrypted personal data and the chat between users should be encrypted too.

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- Some of the supposed algorithms to be used are: **AES-256, ARC4, RSA-2048**.

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- Some of the supposed algorithms to be used are: **AES-256, ARC4, RSA-2048**.
- Other "external" factors which can be used alongside the users identification to securely reset a password may be SMS or physical keys (YubiKey).

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- It should be flexible to be used easily in hard times, also it should offer the testers an instructions about how the application should be tested and what is the correct input and output.
- It also should be adaptable to any environment changes, app must meet portability condition as it used in a critical situations, the last but not least is the maintainability concern and it should be maintained at least one time per week.

Constraints

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Solution Constrains

- Due to the choice of technology, some constraints have arisen mainly in the web crawling section. To start, a crawler must wait between repeated accesses to the same website.

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- Due to the choice of technology, some constraints have arisen mainly in the web crawling section. To start, a crawler must wait between repeated accesses to the same website.
- Otherwise, the crawler can be blocked. In addition, duplicate content can generate a waste of valuable resources.

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Memory & Space Constrains

Our application run on mobile devices with very limited hardware specs which may lead to overheating or battery drain, above all that it will be limited to small amount of ram and storage space on some devices.

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Policy & Privacy

- The application tries to use all the available mobile resource in disastrous times to save all the user in potential danger eg: using the phone while it's on standby mode to alert the user or use mobile flash to help users who are stuck under derbies.

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Policy & Privacy

- The application tries to use all the available mobile resource in disastrous times to save all the user in potential danger eg: using the phone while it's on standby mode to alert the user or use mobile flash to help users who are stuck under derbies.
- Although we do our best to save the user life, this does not mean we will prevent their death 100%, which is must be stated to clear us from any charges.

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Schedule Constrains

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Release

The project has a relatively small time-frame. Therefore, the time is a major concern.
The project should be functioning and completed by the mid of 2019.

Assumption

Main assumption about the product is that it will always be used on mobile phones that have enough performance. If the phone does not have enough hardware resources available for the application.
For example the users might have allocated them with other applications, there may be scenarios where the application does not work as intended or even at all.

Analysis Models

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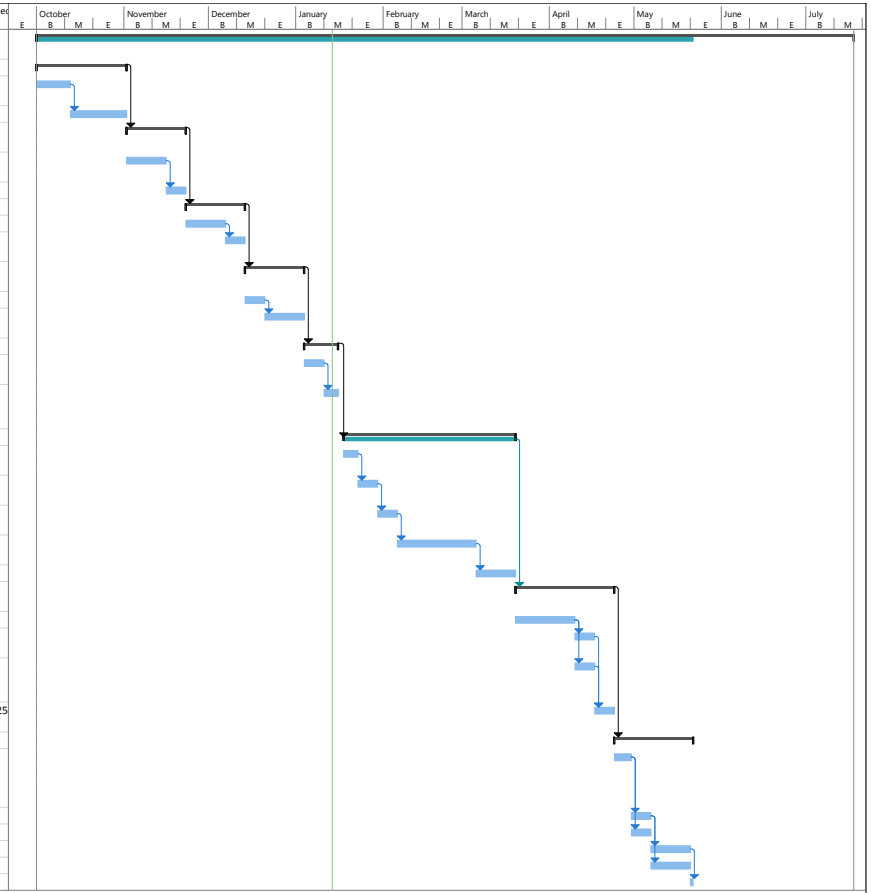
Gantt chart

Detailed View

ID	Task Mode	Task Name	Duration	Start	Finish	Predec
1		**Relevium Application**	**209 days**	**Mon 10/1/18**	**Wed 7/17/19**	
2		**Project Initiating**	**25 days**	**Mon 10/1/18**	**Thu 11/1/18**	
3		Identifying project purpose	2 wks	Mon 10/1/18	Fri 10/12/18	
4		Resource gathering	3 wks	Sat 10/13/18	Thu 11/1/18	3
5		**System concept development**	**15 days**	**Fri 11/2/18**	**Thu 11/22/18**	**2**
6		Defines the boundary of the concept	2 wks	Fri 11/2/18	Thu 11/15/18	
7		Feasibility study	1 wk	Fri 11/16/18	Thu 11/22/18	6
8		**Planning**	**15 days**	**Fri 11/23/18**	**Thu 12/13/18**	**5**
9		Create project plan	2 wks	Fri 11/23/18	Thu 12/6/18	
10		Acquiring the base resources	1 wk	Fri 12/7/18	Thu 12/13/18	9
11		**Requirement analysis**	**15 days**	**Fri 12/14/18**	**Thu 1/3/19**	**8**
12		Analyze user needs	1 wk	Fri 12/14/18	Thu 12/20/18	
13		Create functional requirements	2 wks	Fri 12/21/18	Thu 1/3/19	12
14		**Design**	**8 days**	**Fri 1/4/19**	**Tue 1/15/19**	**11**
15		Designing system models	1 wk	Fri 1/4/19	Thu 1/10/19	
16		Focus on delivering the required functionality	3 days	Fri 1/11/19	Tue 1/15/19	15
17		**Development**	**43 days**	**Fri 1/18/19**	**Tue 3/19/19**	**14**
18		Install system environment	3 days	Fri 1/18/19	Tue 1/22/19	
19		Create and test Database	1 wk	Wed 1/23/19	Tue 1/29/19	18
20		Prepare test case procedures	1 wk	Wed 1/30/19	Tue 2/5/19	19
21		Convert logical design into a physical model	4 wks	Wed 2/6/19	Tue 3/5/19	20
22		Program refining	2 wks	Wed 3/6/19	Tue 3/19/19	21
23		**Integration and testing**	**25 days**	**Wed 3/20/19**	**Tue 4/23/19**	**17**
24		Integrating modules	3 wks	Wed 3/20/19	Tue 4/9/19	
25		Confirm the system functional requiremnt	1 wk	Wed 4/10/19	Tue 4/16/19	24
26		Confirm the system non-functional requiremnt	1 wk	Wed 4/10/19	Tue 4/16/19	24
27		Produce test analysis report	1 wk	Wed 4/17/19	Tue 4/23/19	26,25
28		**Implementation**	**20 days**	**Wed 4/24/19**	**Tue 5/21/19**	**23**
29		Implement the system into the production enviroment	4 days	Wed 4/24/19	Mon 4/29/19	
30		Alpha testing	1 wk	Tue 4/30/19	Mon 5/6/19	29
31		Issue tracking	1 wk	Tue 4/30/19	Mon 5/6/19	29
32		Beta testing	2 wks	Tue 5/7/19	Mon 5/20/19	30
33		Issue tracking	2 wks	Tue 5/7/19	Mon 5/20/19	30
34		Final Release	1 day	Tue 5/21/19	Tue 5/21/19	32



Relevium

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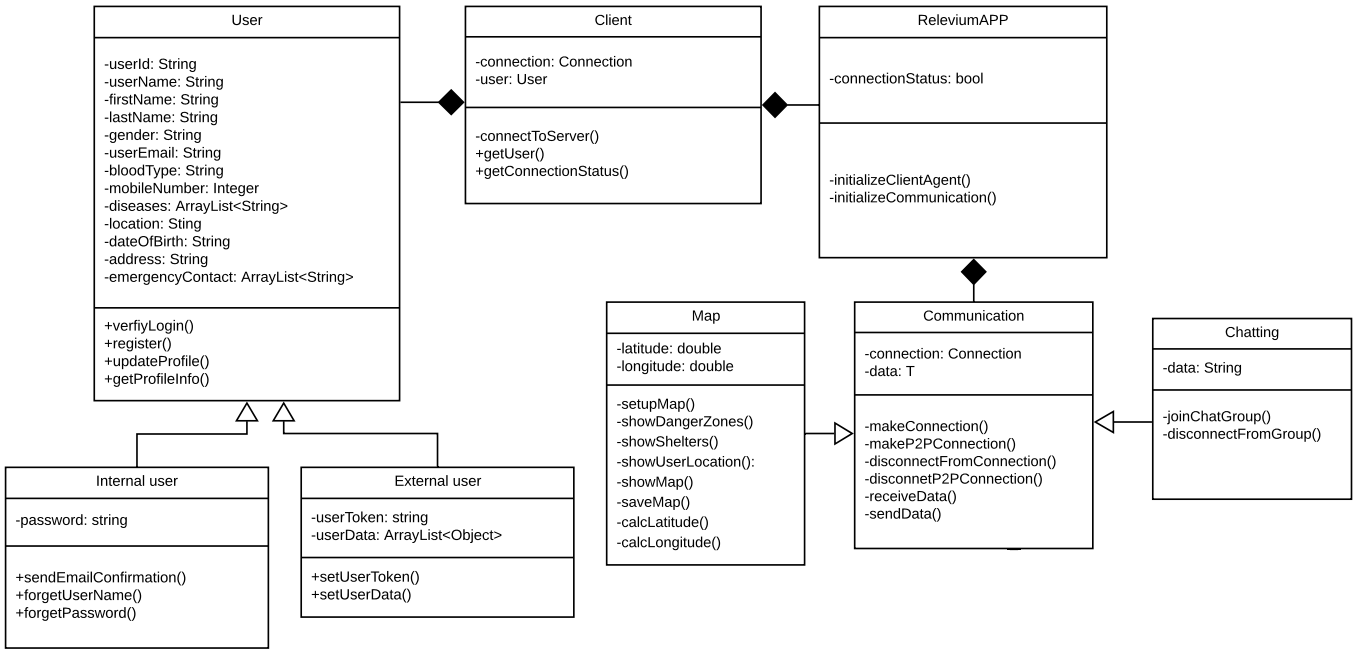
Class Diagram

Client Domain Logic



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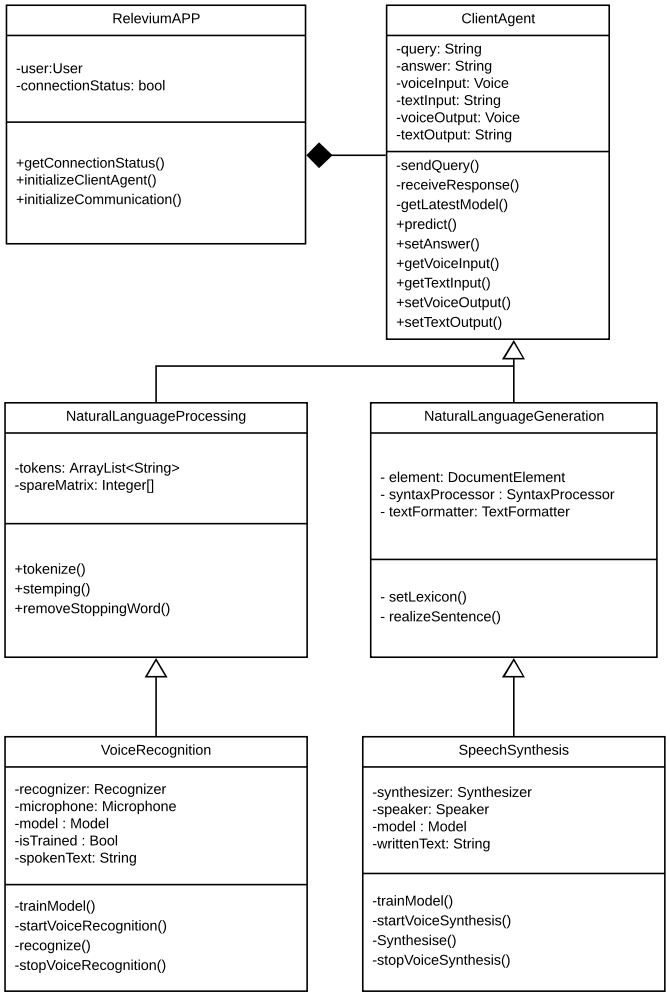
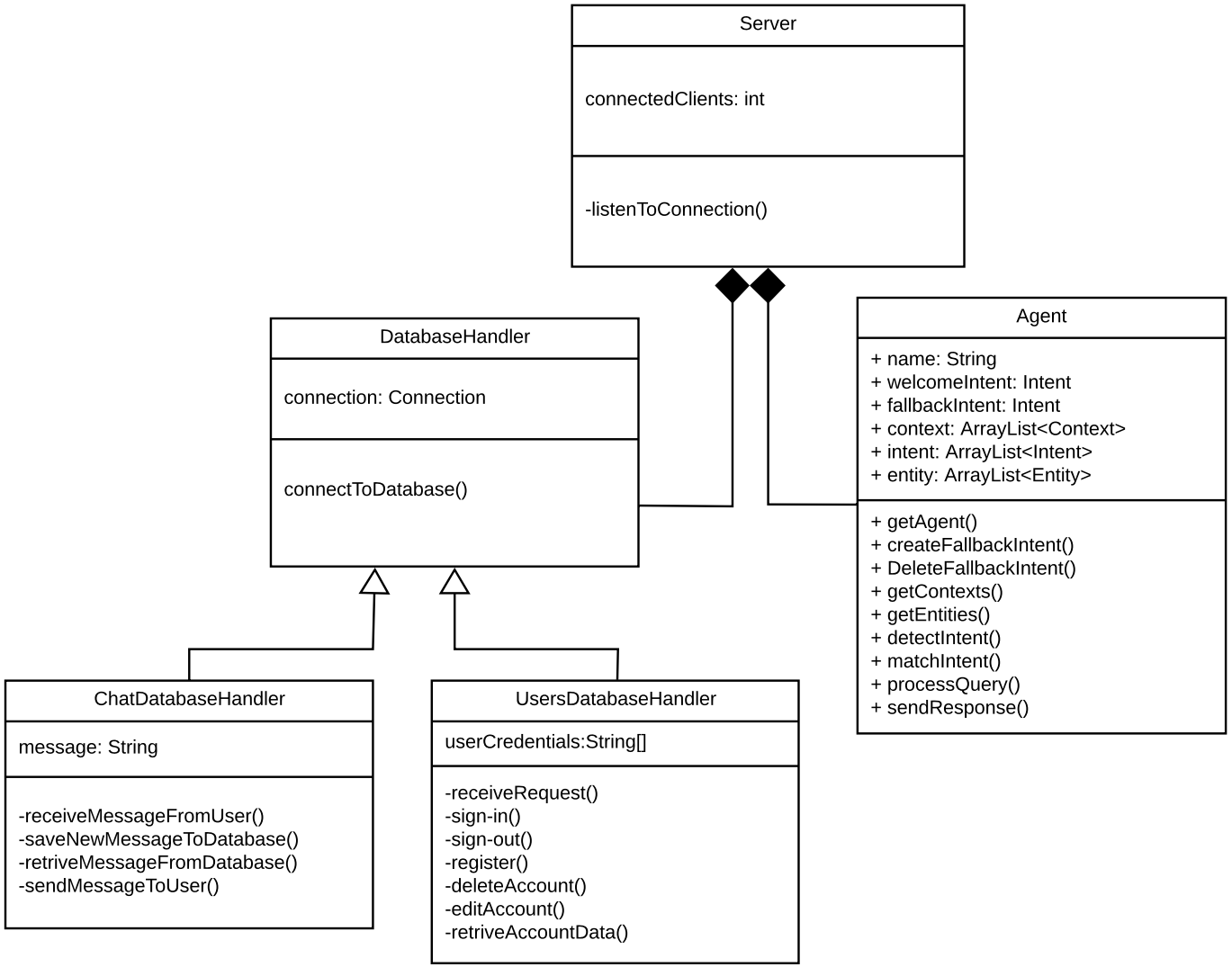
Class Diagram

Client Domain Logic (Cont.)



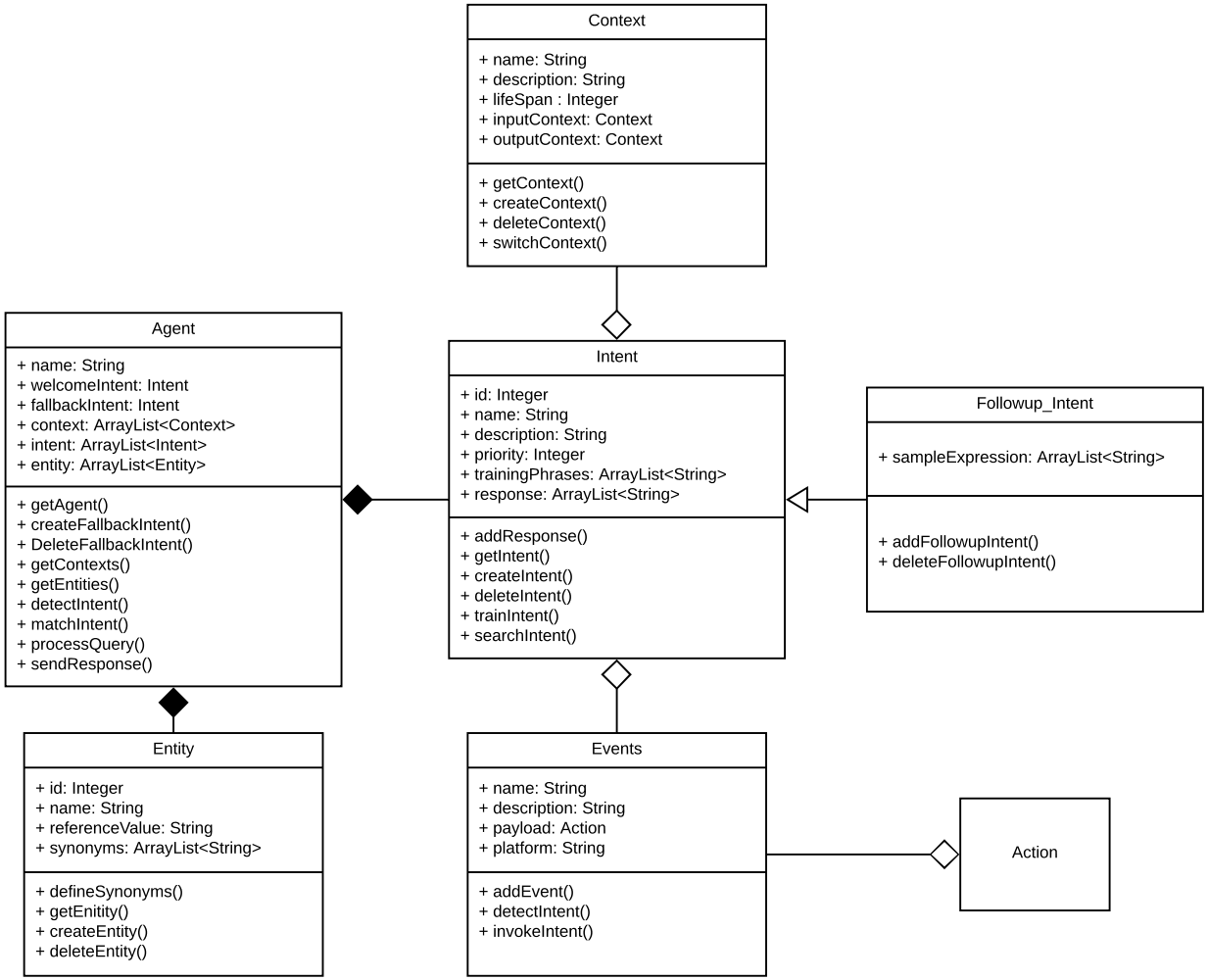
Class Diagram

Server Domain Logic



Class Diagram

Agent Implementation



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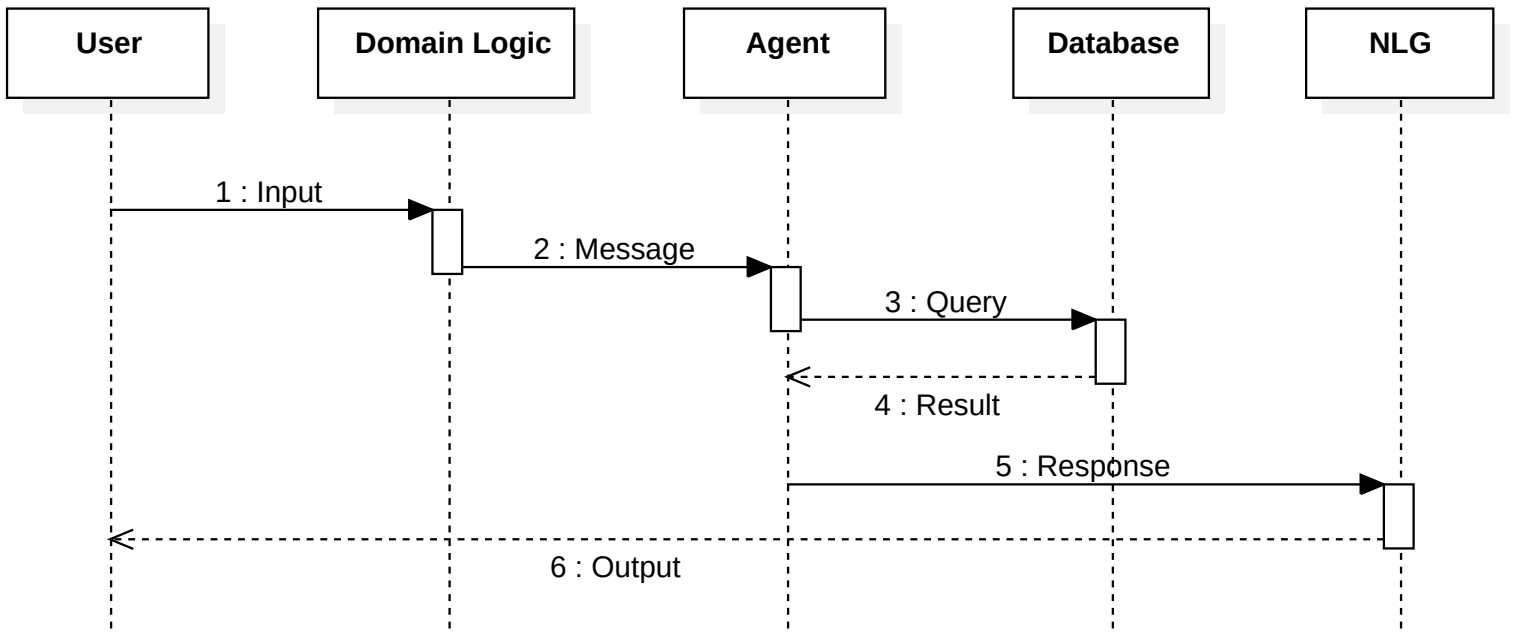
Sequence Diagram

Utterance Route



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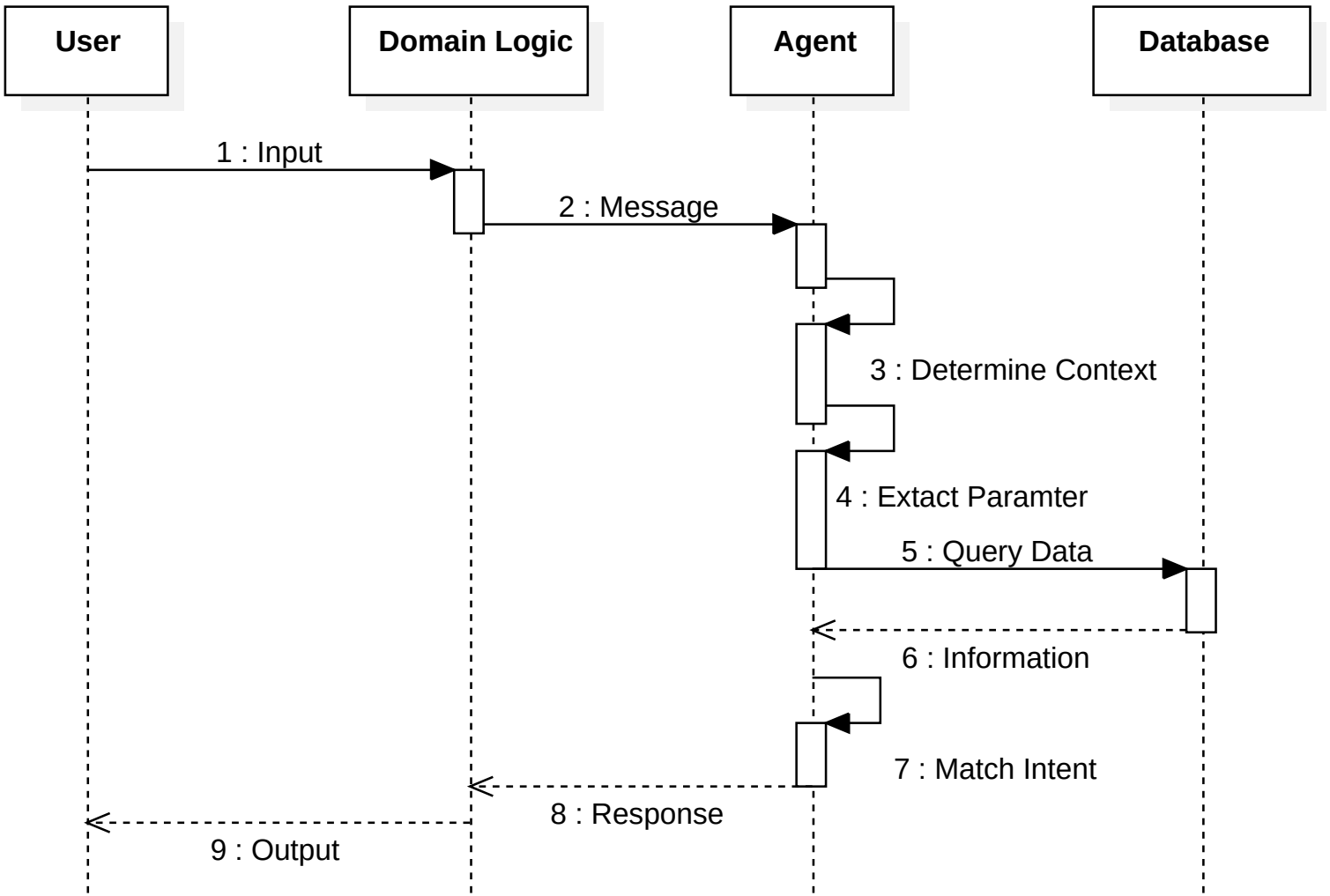
Sequence Diagram

Communication Process



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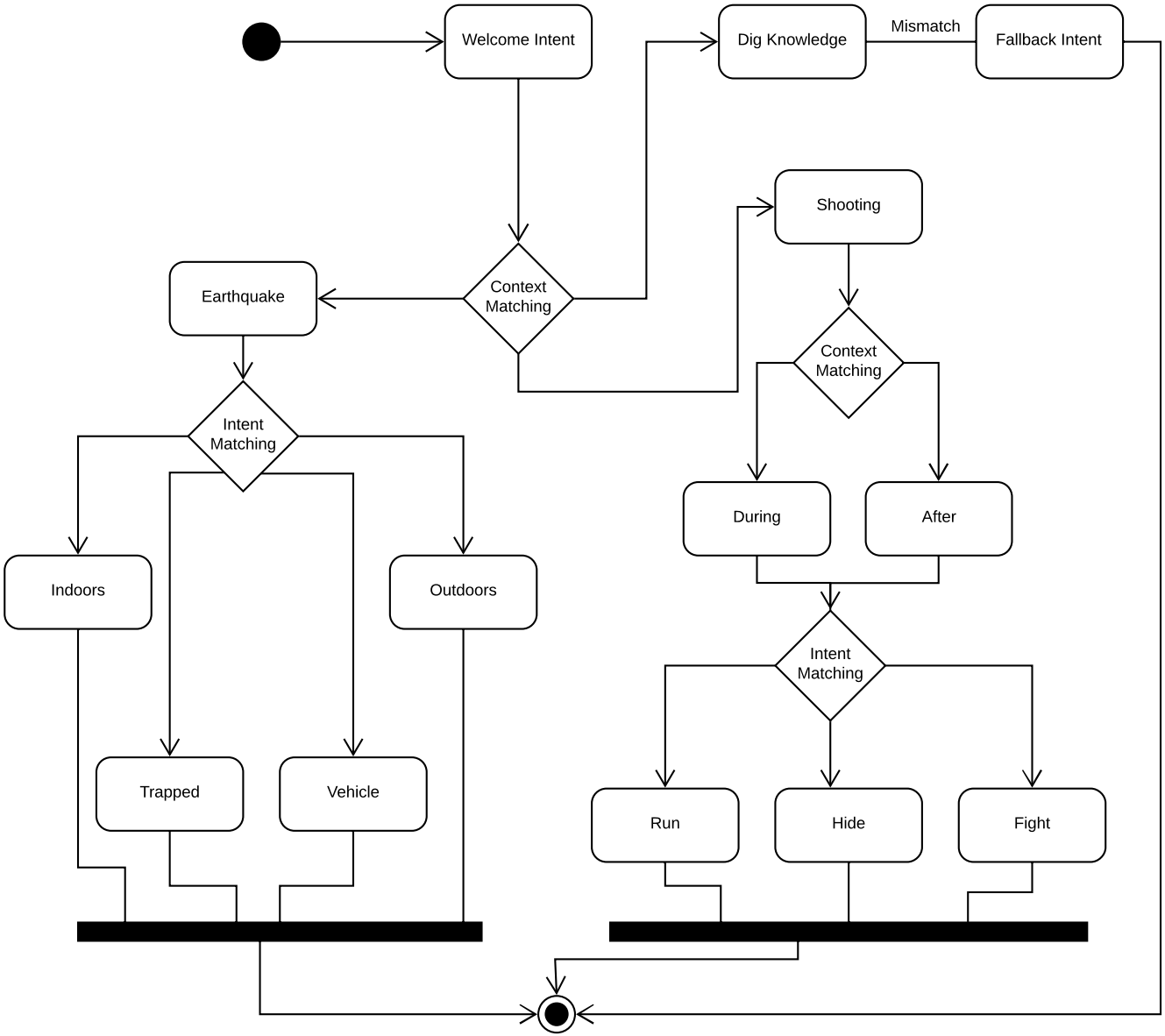
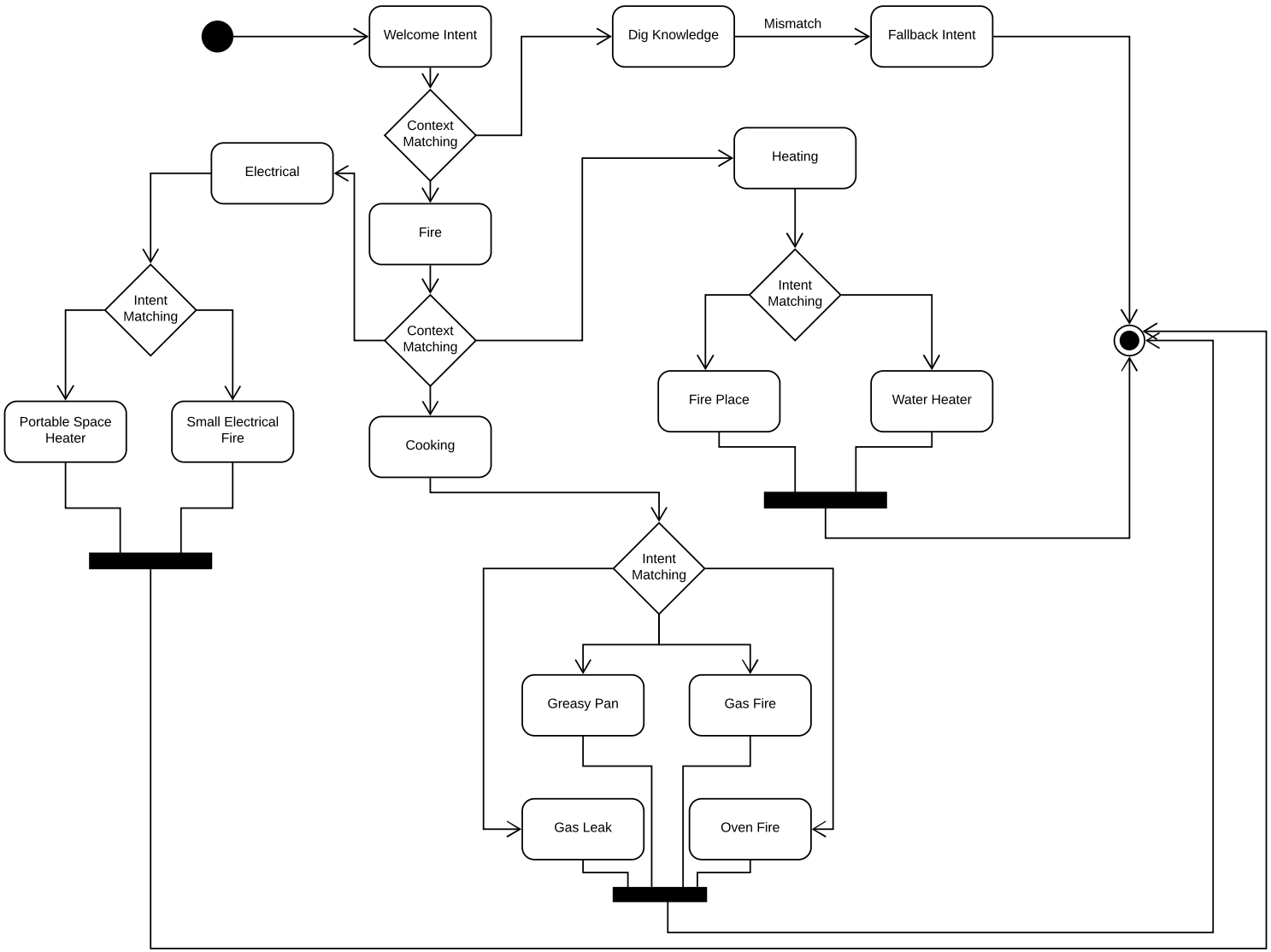
State Chart Diagram

Context Matching



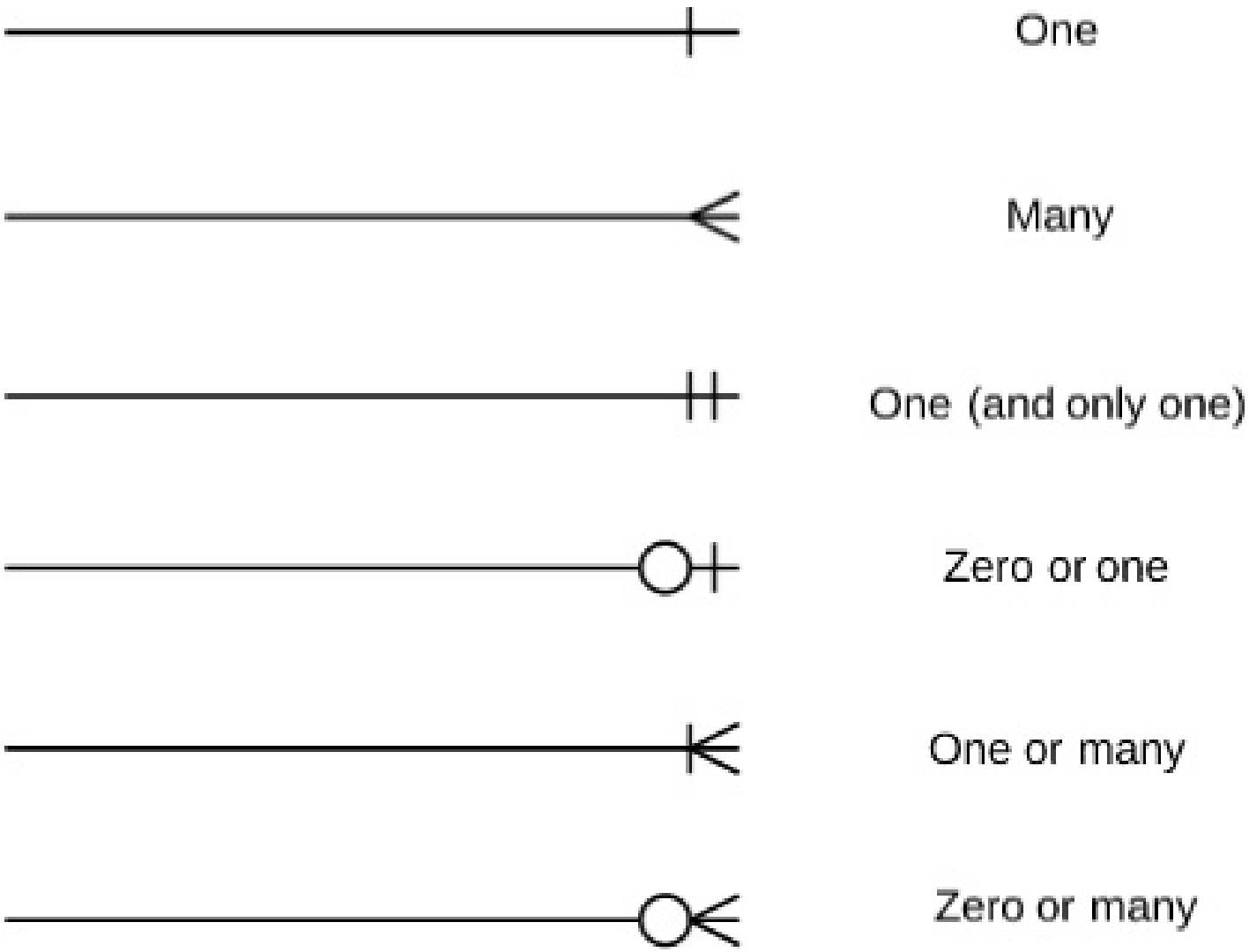
State Chart Diagram

Context Matching (cont.)



Entity Relationship Diagram

Crow Notation



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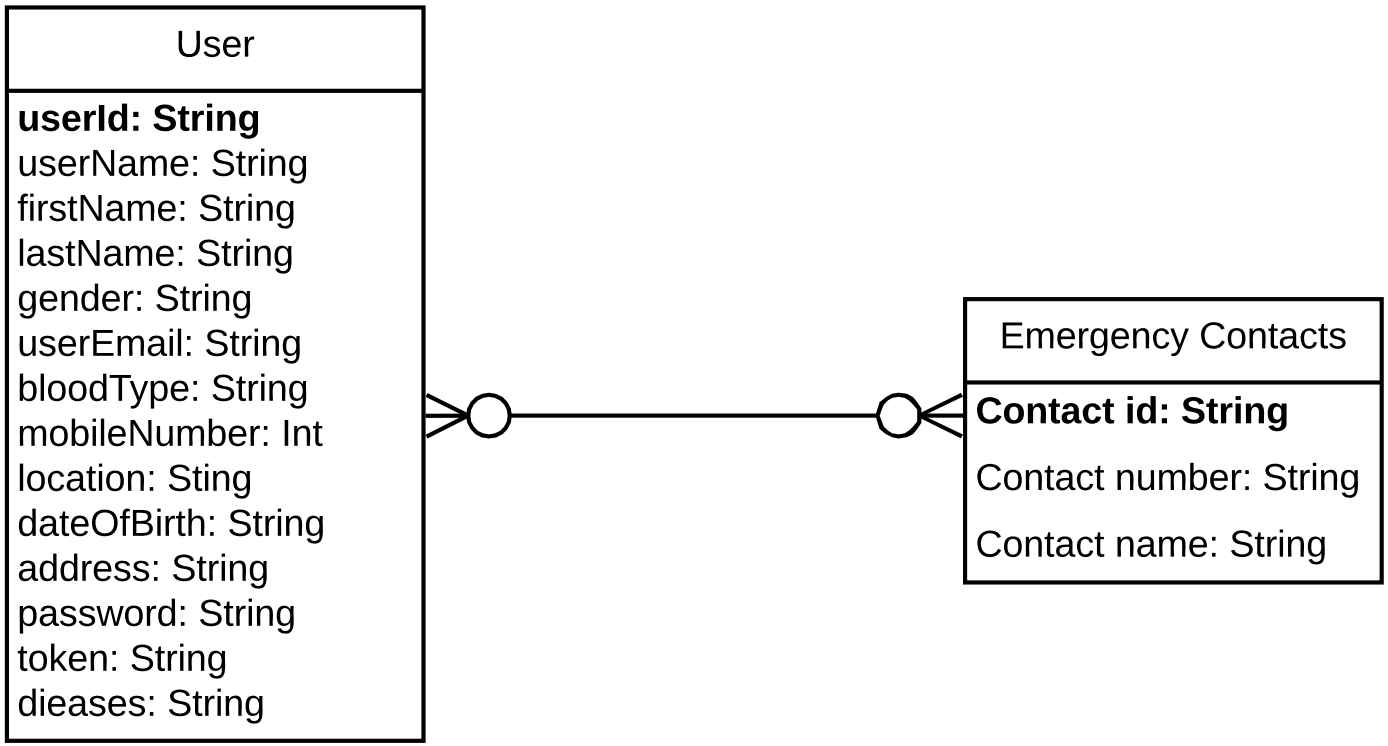
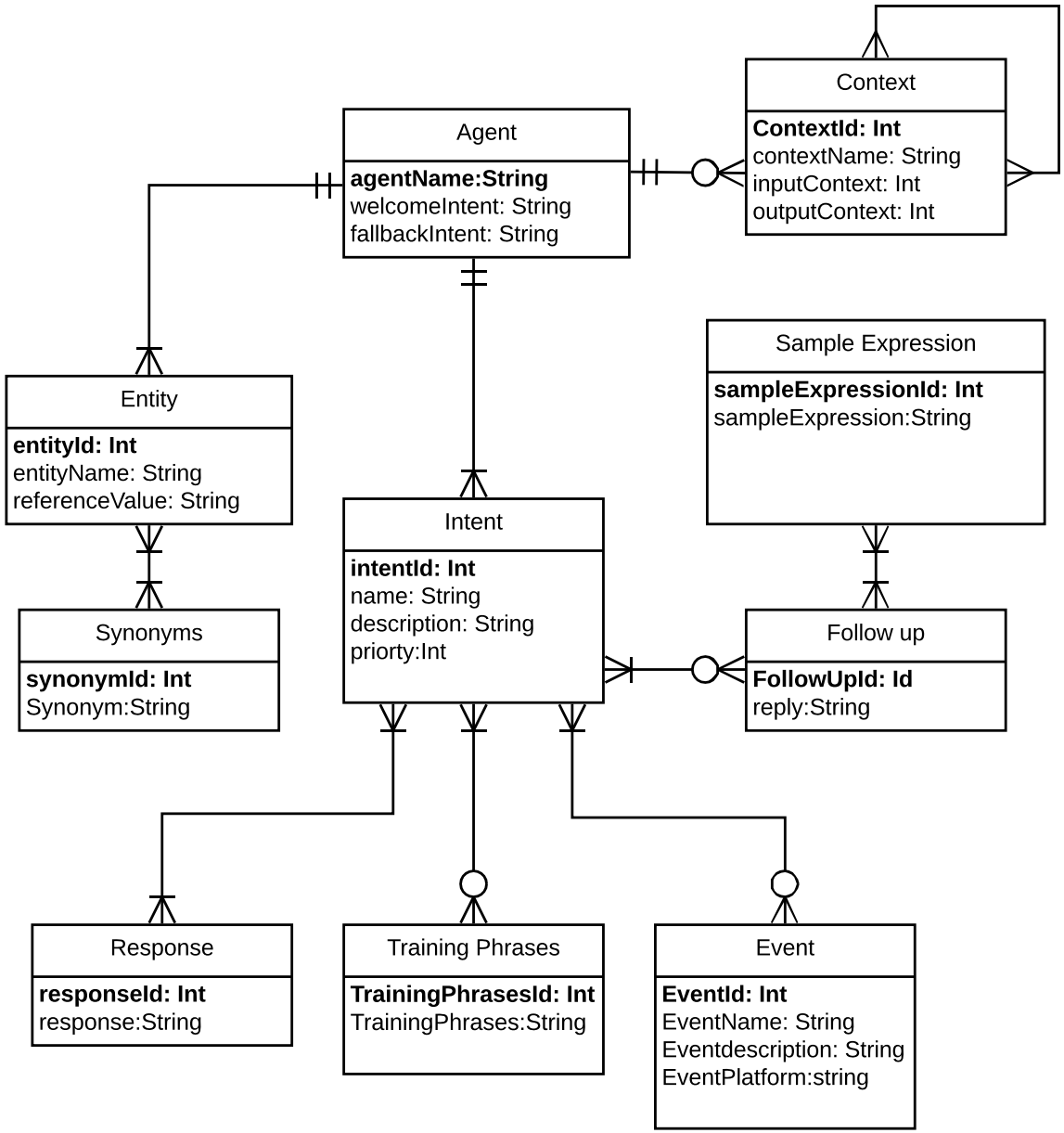
Entity Relationship Diagram

User Entity



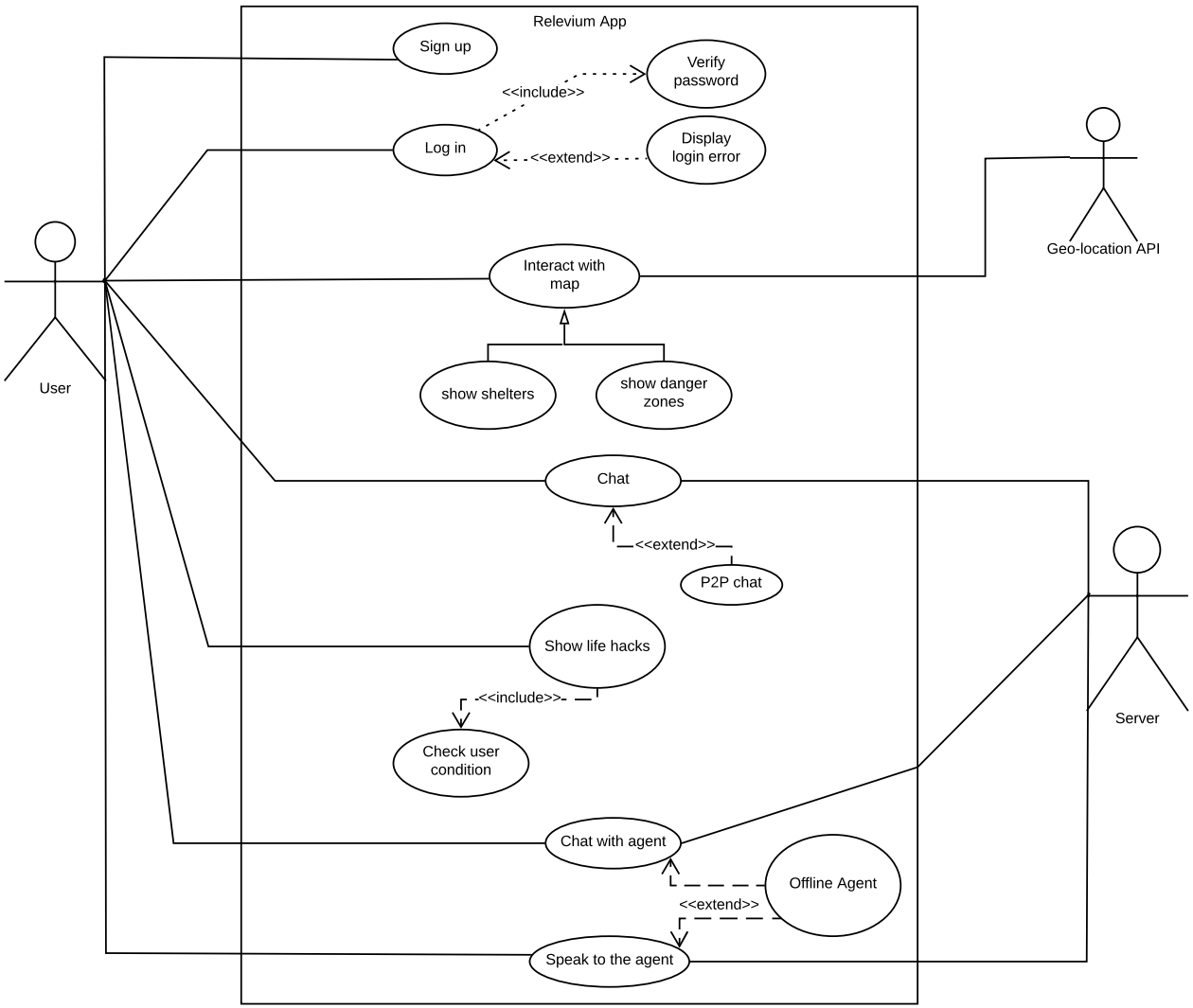
Entity Relationship Diagram

Agent



Use Case Diagram

Application Interaction



AI Approach

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Dynamic Memory Network

- Most tasks in natural language processing can be cast into question answering (QA) problems over language input.

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- The dynamic memory network (DMN) is a neural network architecture which processes input sequences and questions, forms episodic memories, and generates relevant answers.

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Dynamic Memory Network

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- Most tasks in natural language processing can be cast into question answering (QA) problems over language input.
- The dynamic memory network (DMN) is a neural network architecture which processes input sequences and questions, forms episodic memories, and generates relevant answers.
- Questions trigger an iterative attention process which allows the model to condition its attention on the inputs and the result of previous iterations. These results are then reasoned over in a hierarchical recurrent sequence model to generate answers.

Dynamic Memory Network

- The DMN can be trained end-to-end and obtains state-of-the-art results on several types of tasks and datasets:

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  3. Sequence modeling for part-of-speech tagging (WSJ-PTB).

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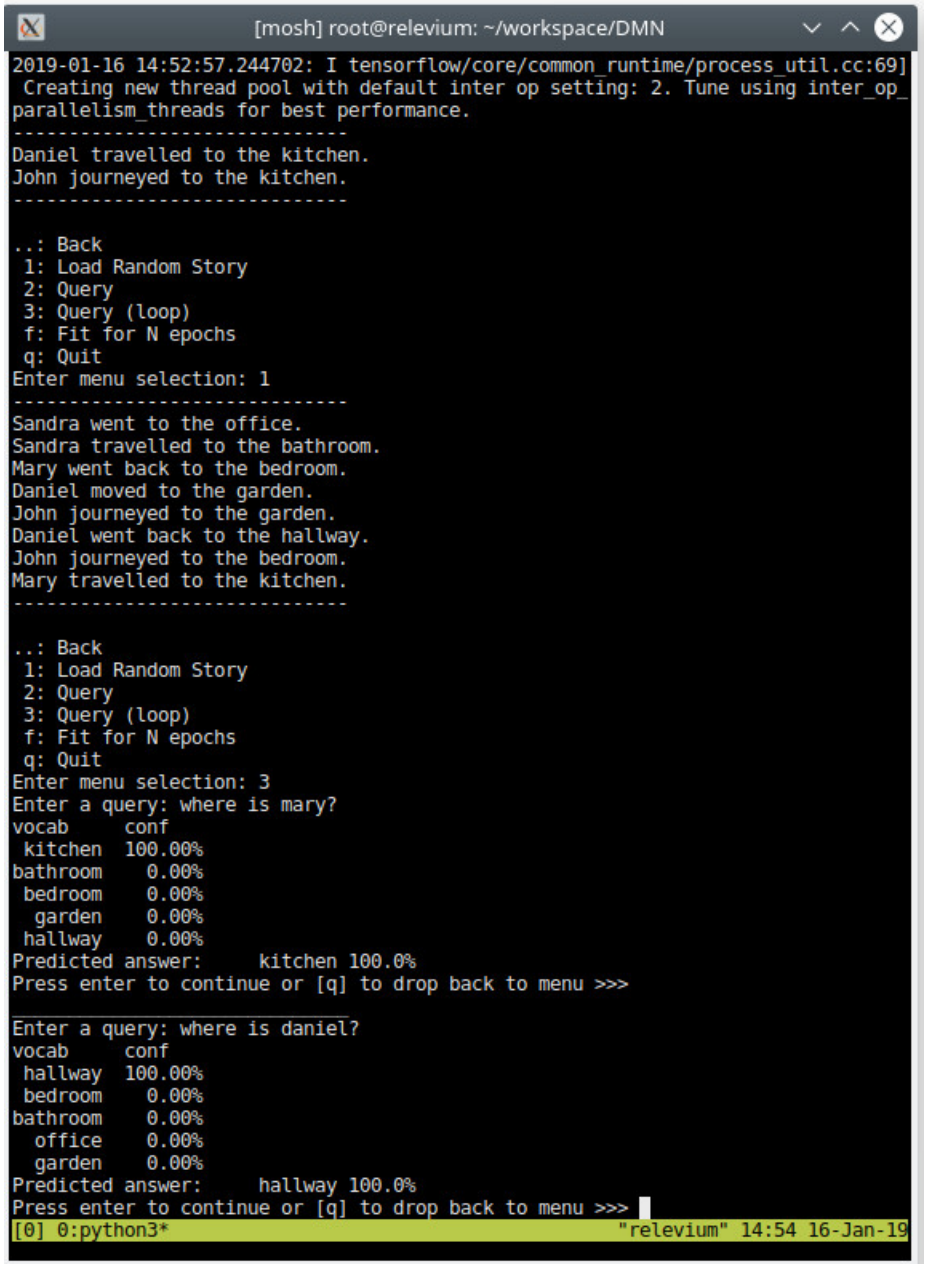
  1. Question answering (Facebook's bAbI dataset).
  2. Text classification for sentiment analysis (Stanford Sentiment Treebank).
  3. Sequence modeling for part-of-speech tagging (WSJ-PTB).
- The training for these different tasks relies exclusively on trained word vector representations and input-question-answer triplets.

Dynamic Memory Network



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SQuAD

What is SQuAD?

Stanford **Qu**estion **A**nswering **D**ataset (SQuAD) is a reading comprehension dataset, consisting of questions posed by crowdworkers on a set of Wikipedia articles, where the answer to every question is a segment of text, or span, from the corresponding reading passage, or the question might be unanswerable.

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SQuAD

What is SQuAD?

- SQuAD2.0 combines the 100,000 questions in SQuAD1.1 with over 50,000 new, unanswerable questions written adversarially by crowdworkers to look similar to answerable ones.

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SQuAD

What is SQuAD?

- SQuAD2.0 combines the 100,000 questions in SQuAD1.1 with over 50,000 new, unanswerable questions written adversarially by crowdworkers to look similar to answerable ones.
- To do well on SQuAD2.0, systems must not only answer questions when possible, but also determine when no answer is supported by the paragraph and abstain from answering. SQuAD2.0 is a challenging natural language understanding task for existing models.

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SQuAD

Leaderboard - October 2018

Rank	Model	EM	F1
	Human Performance *Stanford University* (Rajpurkar & Jia et al. '18)	86.831	89.452
1 Sep 13, 2018	nlnet (single model) *Microsoft Research Asia*	**74.238**	**77.022**
2 Oct 12, 2018	YARCS (ensemble) *IBM Research AI*	72.670	75.493
3 Oct 13, 2018	RNANetSimple (ensemble) *Anonymous*	72.602	75.089
4 Sep 17, 2018	Unet (ensemble) *Fudan University & Liulishuo Lab* https://arxiv.org/abs/1810.06638	71.553	75.011
4 Aug 15, 2018	Reinforced Mnemonic Reader + Answer Verifier (single model) *NUDT* https://arxiv.org/abs/1808.05759	71.699	74.238
4 Aug 28, 2018	SLQA+ (single model) *Alibaba DAMO NLP* http://www.aclweb.org/anthology/P18-1158	71.451	74.422

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SQuAD

Leaderboard - January 2019

Rank	Model	EM	F1
	Human Performance *Stanford University* (Rajpurkar & Jia et al. '18)	86.831	89.452
1 Jan 10, 2019	BERT + Synthetic Self-Training (ensemble) *Google AI Language* https://github.com/google-research/bert	**84.292**	**86.967**
2 Dec 21, 2018	PAML+BERT (ensemble model) *PINGAN GammaLab*	83.457	86.122
2 Dec 16, 2018	Lunet + Verifier + BERT (ensemble) *Layer 6 AI NLP Team*	83.469	86.043
2 Dec 13, 2018	BERT finetune baseline (ensemble) *Anonymous*	83.536	86.096
3 Dec 15, 2018	Lunet + Verifier + BERT (single model) *Layer 6 AI NLP Team*	82.995	86.035
4 Jan 10, 2019	BERT + Synthetic Self-Training (single model) *Google AI Language* https://github.com/google-research/bert	82.972	85.810

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Deep Bidirectional Transformers for NLP

BERT

Bidirectional Encoder Representations from Transformers, is a new method of pre-training language representations which obtains state-of-the-art results on a wide array of Natural Language Processing (NLP) tasks.

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Deep Bidirectional Transformers for NLP

- BERT is a method of pre-training language representations, meaning that we train a general-purpose "language understanding" model on a large text corpus (like Wikipedia), and then use that model for downstream NLP tasks that we care about (like question answering).

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Deep Bidirectional Transformers for NLP

- BERT is a method of pre-training language representations, meaning that we train a general-purpose "language understanding" model on a large text corpus (like Wikipedia), and then use that model for downstream NLP tasks that we care about (like question answering).
- BERT outperforms previous methods because it is the first unsupervised, deeply bidirectional system for pre-training NLP.

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Unsupervised

Unsupervised means that BERT was trained using only a plain text corpus, which is important because an enormous amount of plain text data is publicly available on the web in many languages.

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Pre-trained representations can also either be context-free or contextual, and contextual representations can further be unidirectional or bidirectional.
Context-free models such as **word2vec** or **GloVe** generate a single "word embedding" representation for each word in the vocabulary, so bank would have the same representation in bank deposit and river bank.
Contextual models instead generate a representation of each word that is based on the other words in the sentence.

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BERT was built upon recent work in pre-training contextual representations including Semi-supervised Sequence Learning, Generative Pre-Training, **ELMo**, and **ULMFit** but crucially these models are all unidirectional or shallowly bidirectional. This means that each word is only contextualized using the words to its left (or right).

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For example, in the sentence I made a bank deposit the unidirectional representation of bank is only based on I made a but not deposit. Some previous work does combine the representations from separate left-context and right-context models, but only in a "shallow" manner. BERT represents "bank" using both its left and right context I made a ... deposit starting from the very bottom of a deep neural network, so it is deeply bidirectional.

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Deep Bidirectional Transformers for NLP

BERT-Base, Multilingual Cased: 104 languages, 12-layer, 768-hidden, 12-heads, 110M parameters

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Deep Bidirectional Transformers for NLP

BERT-Base, Multilingual Cased: 104 languages, 12-layer, 768-hidden, 12-heads, 110M parameters

- Pre-training is fairly expensive (four days on 4 to 16 Cloud TPUs), but is a one-time procedure for each language (current models are English-only). They are releasing a number of pre-trained models from the paper which were pre-trained at Google. Most NLP researchers will never need to pre-train their own model from scratch.

Deep Bidirectional Transformers for NLP

BERT-Base, Multilingual Cased: 104 languages, 12-layer, 768-hidden, 12-heads, 110M parameters

- Fine-tuning is inexpensive. All of the results in the paper can be replicated in at most 1 hour on a single Cloud TPU, or a few hours on a GPU, starting from the exact same pre-trained model. SQuAD, for example, can be trained in around 30 minutes on a single Cloud TPU to achieve a Dev F1 score of 91.0%, which is the single system state-of-the-art.

Business Model

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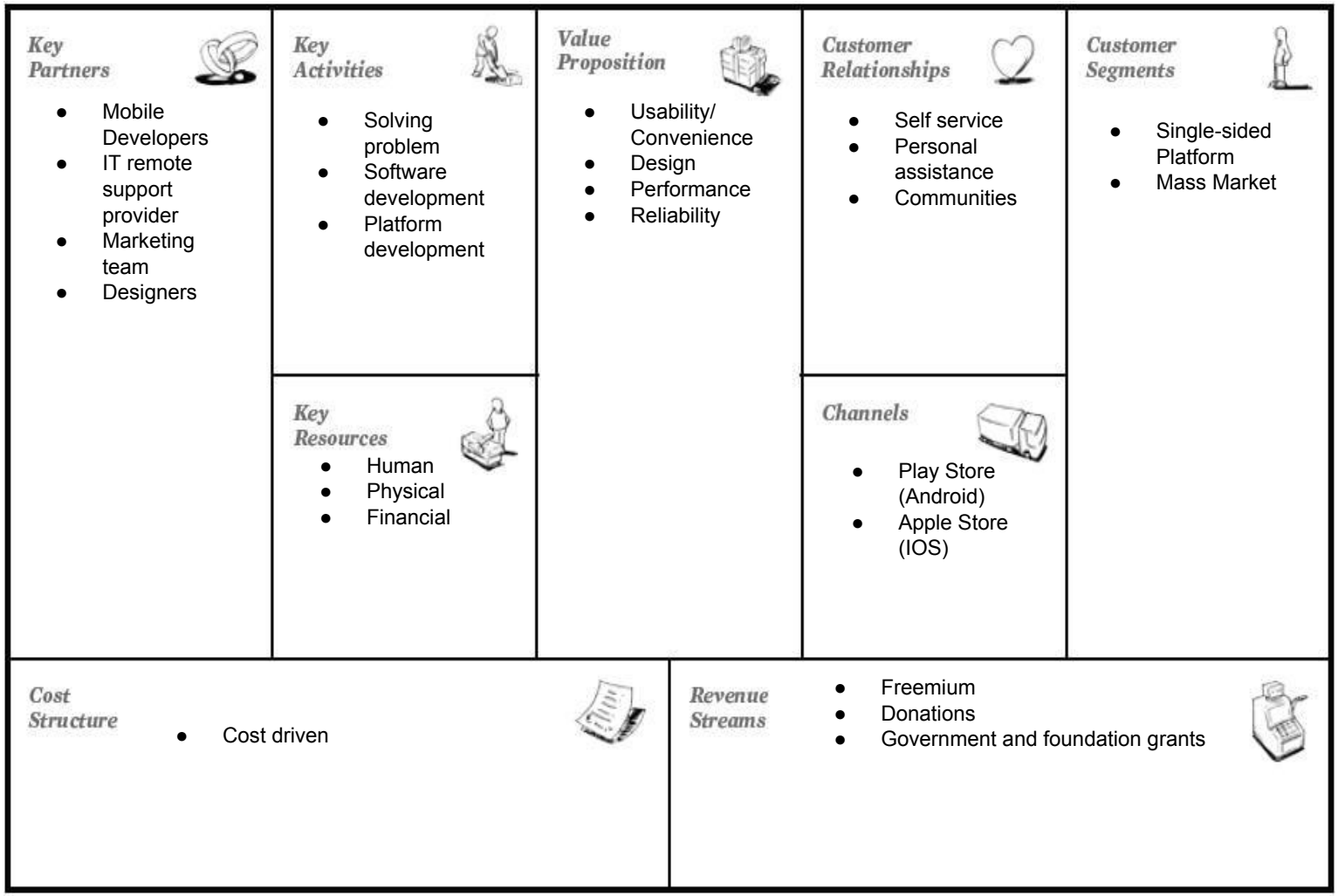
Business Model

Definitions

1. **Customer Segments**: Who are the customers? What do they think? See? Feel? Do?
2. **Value Propositions**: What's compelling about the proposition? Why do customers buy, use?
3. **Channels**: How are these propositions promoted, sold and delivered? Why? Is it working?
4. **Customer Relationships**: How do you interact with the customer through their 'journey'?
5. **Revenue Streams**: How does the business earn revenue from the value propositions?
6. **Key Activities**: What *uniquely* strategic things does the business do to deliver its proposition?
7. **Key Resources**: What unique strategic assets must the business have to compete?
8. **Key Partnerships**: What can the company *not* do so it can focus on its Key Activities?
9. **Cost Structure**: What are the business' major cost drivers? How are they linked to revenue?

Business Model

Canvas



Prototype

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Actual Prototype

Relevium App Design

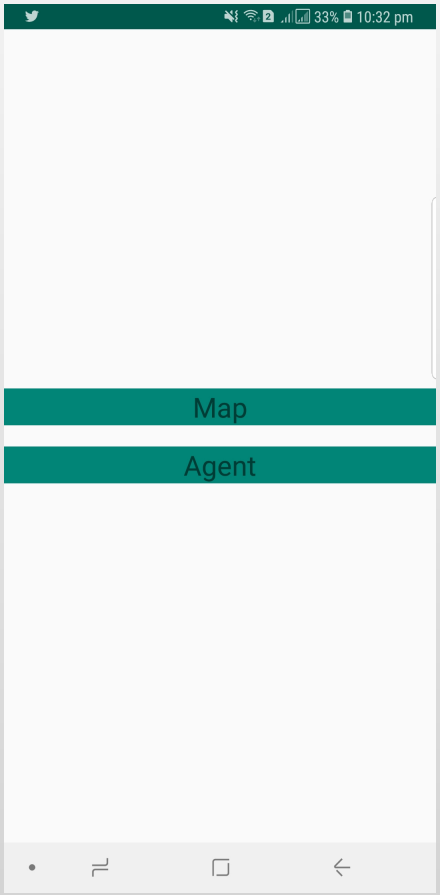

Figure: Relevium Home Screen

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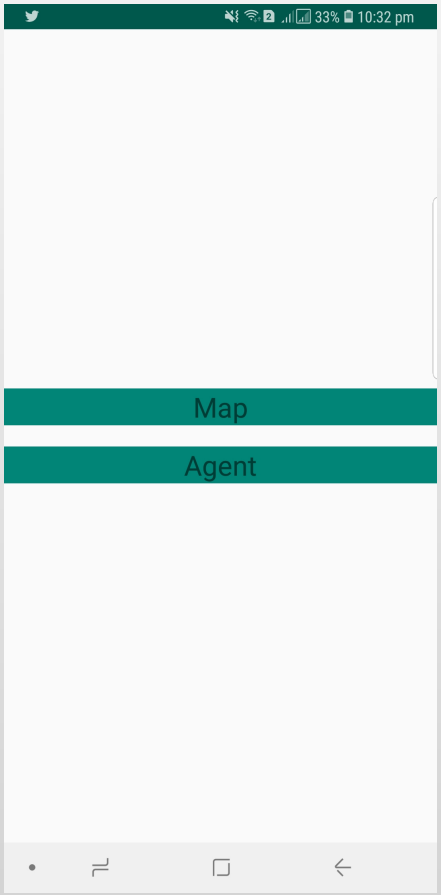
Actual Prototype

Relevium App Design



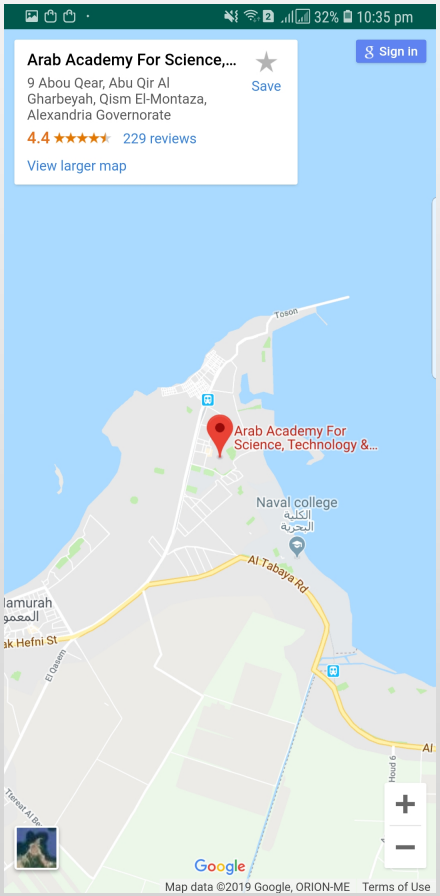
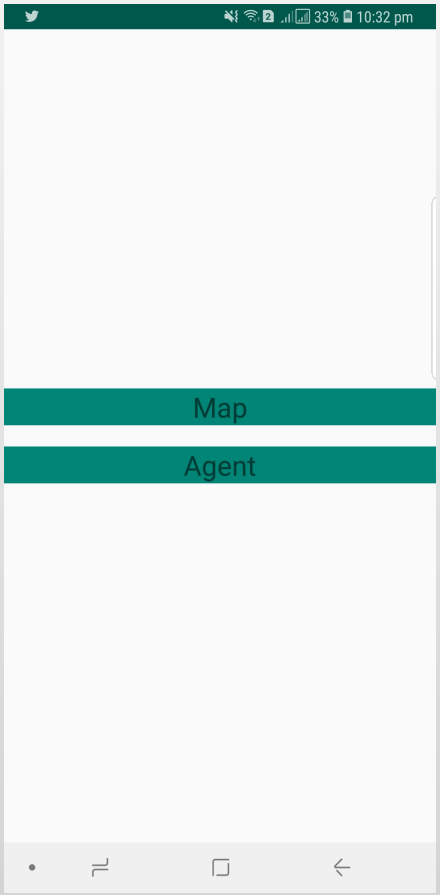


Figure: Click "**Map**"

Actual Prototype

Relevium App Design



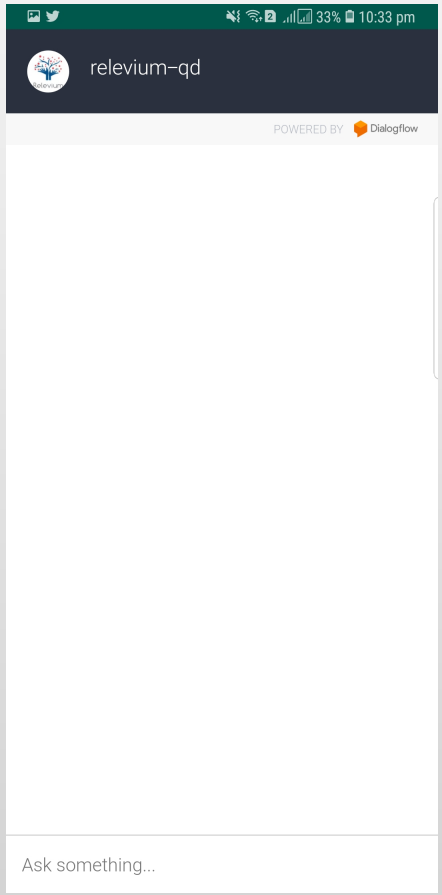


Figure: Click "**Agent**"

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Actual Prototype

Relevium App Design

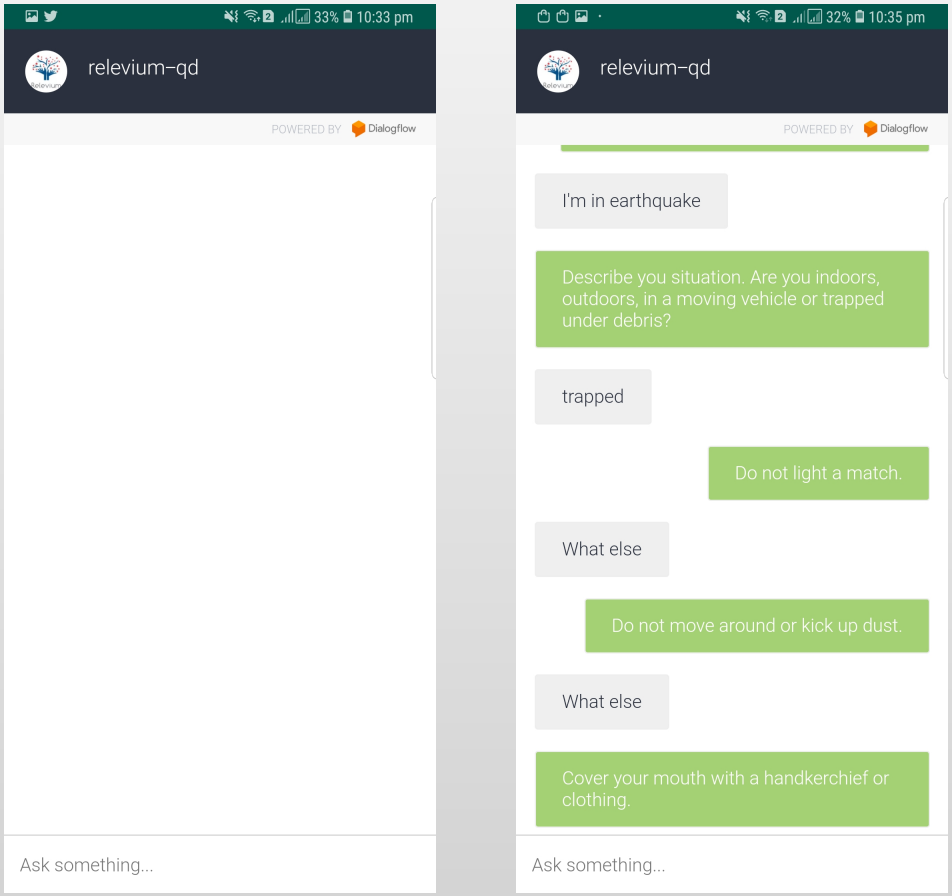

Figure: Live "**Agent**"

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Expected Prototype

Figure: Relevium Home Screen

Expected Prototype

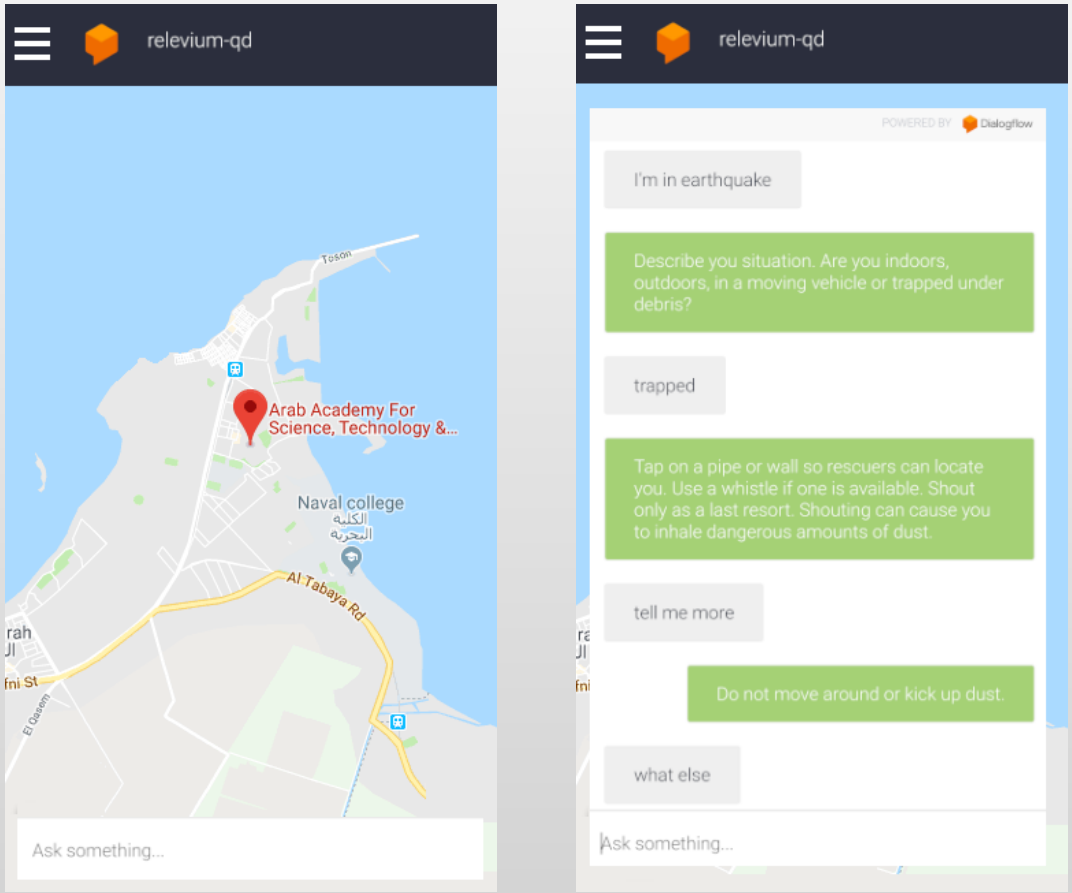

Figure: Chat "**Agent**"

Expected Prototype

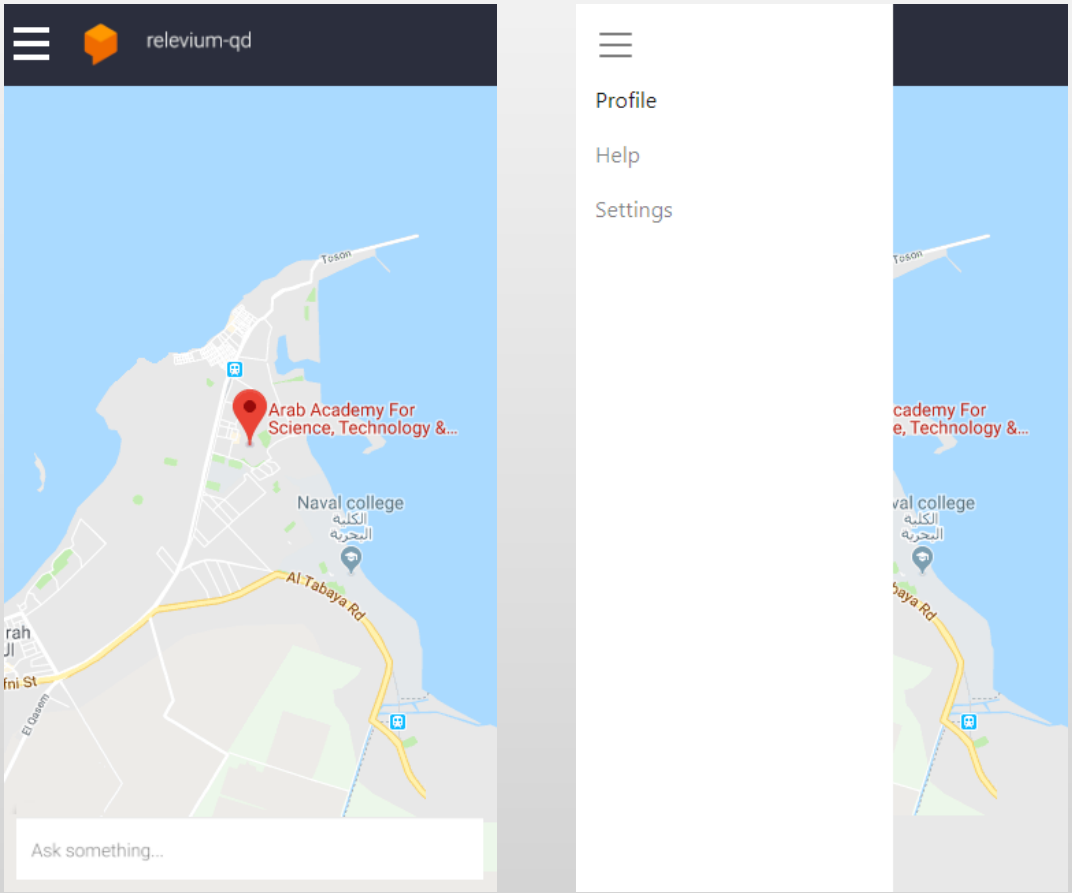

Figure: Features List

Live Demo

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