

A PROJECT REPORT

ON

“BANKING BOT”

Submitted in partial fulfillment of the requirements

For the degree of

BACHELOR OF ENGINEERING

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CERTIFICATE

This is to certify that the project entitled “**BANKING BOT**” is a bonafide work of “**Preksha Shetye (B-204)**”, “**Janhavi Patil (B-202)**”, “**Ravina Dalvi (B-205)**”, submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of “**Bachelor of Engineering**” in “**Computer Engineering**” .

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A PROJECT REPORT

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TABLE OF CONTENTS

Abstract.....	I
Acknowledgement.....	II
List of figures	III
Table of contents.....	IV

Chapter 1. Introduction

1.1 Introduction.....	1
1.2 Motivation.....	2
1.3 Statement of the problem.....	

Chapter 2. Literature Survey.....

2.1 Survey Existing System	
2.2 Limitation Existing system or research gap	
2.3 Problem Statement and Objective	
2.4 Scope of the Work	

Chapter 3. Proposed System

3.1 Analysis/Framework/ Algorithm	
3.2 Details of Hardware & Software	
3.3 Design details	
3.4 Methodology	

Chapter 4. Conclusion

Chapter 5. References (Books, journals and other online references)

** Annexure (if applicable) : Any paper presentation, research funding, sponsorship information may be included.

ABSTRACT

The bank system has many processes which are not easy to understand to the user and thus it is time consuming for the user to interact with bank services. It thus becomes necessary to develop a banking chatbot system that will interact with user easily. Intelligent chat bot will be used to give information or answers to any question asked by user related to bank. The proposed system would help replicate the customer service experience with one difference that the customer would be interacting with a bot instead of a real person and yet get the queries attended and resolved. It can extend daily life, by providing solutions to help desks, telephone answering systems, customer care centers. Our chatbot system will first take input from bank customer. This input will be taken as voice or written format. According to the input, system will process the query and give response to user.

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List of Figures

Sr. No.	Figure no.	Figure Name	Page no.
1.	3.3.1	System Architecture	21
2.	3.3.2	Entity Relationship Diagram	22
3.	3.3.3	Use Case Diagram	23
4.	3.3.4	Activity Diagram	24
5.	3.3.5	Sequence Diagram	25
6.	3.3.6	Sequence Diagram for Log In	26
7.	3.3.7	Sequence Diagram for Funds Transfer	27
8.	3.3.8	Sequence Diagram for Loan Enquiry	28
9.	3.3.9	Sequence Diagram for Account Details	29
10.	3.3.10	Class Diagram	30

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Banks play important role in every country's economic development. In day-to-day life, everybody needs banks. But most of the people, especially the first-timers, struggle to know various procedures and processes required to get their work done at the bank and avail of its different services. Currently banks have their own web-sites, mobile applications and facilities like internet banking, mobile banking but sometimes, these sources can be a bit overwhelming for most of the users who are either not well versed with technology or in some cases where the information is too scattered to search for easily. There are different types of platforms provided by different banks but people are facing problems accessing them. People have queries about various bank policies, loans, fixed deposits. This results in unnecessary crowd in banks for inquiry. Banks also face problems solving repeated queries of customers. This is time consuming and banking staff gets frustrated. Manpower and money gets wasted for separate inquiry counter.

A chat bot is a conversational agent that interacts with users in a certain domain on certain topic with natural language sentences. Normally a chat bot works by a user asking a question or initiating a new topic. Chat bots can be called as software agents that simulate an entity usually a human. These are the software with artificial intelligence which allows them to understand users input and provide meaningful response using predefined knowledge base.

Developing a chat bot will provide a smart solution to solve these queries, provide information as and when required, improve service and increase number of customers. It removes human factors included in organization and can give 24/7 hours service to increase productivity.

1.2 MOTIVATION

Conversations with customers have become the need of the hour for businesses. Now we are witnessing a paradigm shift from mass-centered to granular, account-based approach.

Banks and other financial institutions, who work closely with customers and rely heavily on customer relationships, have always leveraged technology to assist them.

First, it was internet banking in the late 90s, then mobile banking when the smartphone revolution took over the world. Now, with the advent of AI and machine cognizance, conversational banking is on the rise.

Conversational banking is nothing but communication between a bank and its customer through text, voice or visual interface. It adds that extra touch of personalization in customer relationships.

Conversational banking, though highly effective, comes with the hardship of effective implementation given the sheer volume of customers banks serve (or any B2C business for that matter).

That is why AI becomes extremely important in conversational banking. With chatbots and virtual assistants, banks can serve their customers effectively without spending huge amounts of time, resources and manpower.

1.3 PROBLEM STATEMENT

It is evident from the research that bank services are constantly seeking to expand their technologies, both to improve customer service and increase delivery of services through the advancements in technology. This is to gain a competitive edge over other banks for financial benefits and to expand its customer base. A domain specific chatbot will be implemented to assist users with their banking. In order to overcome the user satisfaction issues associated with online banking services. The chatbot will provide personal and efficient communication between the user and their bank in order to manage their finances and get assistance when needed, such as; answering any queries and booking appointments. The chatbot will allow users to feel confident and comfortable when using this service regardless of the user's computer literacy due to the natural language used in messages. It also provides a very accessible and efficient service as all interactions will take place within the one chat conversation negating the need for the user to navigate through a site.

To create a chat-bot based interactive question-answering system capable of pronominal anaphora in a user-driven dialogue. The intention is that a user will be able to collect data on a given subject faster.

CHAPTER 2

LITERATURE SURVEY

2.1 Survey Existing System

Banking organizations are leveraging artificial intelligence to launch chatbots, reducing costs and serving consumers.

1. Erica, by Bank of America:

As a market leader in both mobile banking use and AI implementations in the U.S., Bank of America introduced Erica, to send notifications to customers, provide balance information, suggest to save money, provide credit report updates, pay bills and help customers with simple transactions.

2. Amex Bot By American Express:

Leveraging their relationship with merchants, American Express provides benefits to their customers with the help of chatbots named Amex Bot, including real-time sale notifications, contextual recommendations, and reminders about credit card benefits. Amex Bot was deployed on Facebook Messenger.

3. EVA by HDFC Bank:

HDFC Bank's EVA (Electronic Virtual Assistant) is an AI-powered banking assistant developed with the objective of providing better and faster service to HDFC's customers. EVA understands user queries and fetches the requested information from thousands of possible sources, in a matter of milliseconds.

2.2 Limitation Existing system or research gap:

- The existing chatbots does not provide voice input.
- The existing system does not contain tone analyzer to detect emotion in a conversation.
- The proposed system will handle more unique and complex queries.

2.3 Problem Statement and Objective:

The objective of our project is to provide quick service and transactional support. Most basic tasks such as balance inquiry, bank account details, loan enquiry and fund transfer can be handled by a bot efficiently. Chatbot use can be cheaper than hiring more workers. humans handling customer service questions and other issues can make errors. They can forget things, transpose numbers, and make other types of mistakes, not so with chatbots. Based on the questions asked they will always give the right answers. Chatbots are more intuitive and easier to use than a traditional banking app.

2.4 Scope of the Work:

Quite close to be mainstream customer support to replace humans, chatbots have evolved by riding the artificial intelligence wave.

Every passing day they are becoming more intelligent. Inarguably the face of chatbots will undergo immense changes by 2020 than what they are now.

Chatbots have a potential to engage its audience. Since it works as a messaging app, users get engaged with it quickly.

CHAPTER 3

PROPOSED SYSTEM

3.1 Analysis/Framework/ Algorithm:

PASSAGE RETRIEVAL:

Passage Retrieval lets you find pieces of information within large and varied documents that are ingested into Discovery. After it finds the documents, it identifies the most likely, relevant snippets based on your query, and uses intelligent scoring algorithms to rank the passages. For developers, Passage Retrieval can reduce the time that it takes to hand-craft data into consumable units of information for conversational chat bots or search and exploration interfaces.

IBM's passage retrieval algorithm computes a series of distance measures for the passage. The “matching words measure” sums the idf values of words that appear in both the query and the passage. The “thesaurus match measure” sums the idf values of words in the query whose WordNet synonyms appear in the passage. The “mis-match words measure” sums the idf values of words that appear in the query and not in the passage. The “dispersion measure” counts the number of words in the passage between matching query terms, and the “cluster words measure” counts the number of words that occur adjacently in both the question and the passage. These various measures are linearly combined to give the final score for a passage.

TONE ANALYZER :

We have used Watson Tone Analyzer service for detecting customer tones in written text. The IBM Watson Tone Analyzer service is based on the theory of psycholinguistics, a field of research that explores the relationship between linguistic behavior and psychological theories. The service uses linguistic analysis and the correlation between the linguistic features of written text and emotional and language tones to develop scores for each of these tone dimensions.

IBM has trained a machine-learning model based on the **Support Vector Machine (SVM)** to predict tone for new customer-care utterances. For the machine-learning model, IBM leveraged several categories of features:

- N-gram features
- Lexical features from various dictionaries
- The existence of second-person references in the conversation

- Some dialogue-specific features such as saying thank you or apologizing

General Purpose Model (For tone analyzing) :

The general-purpose endpoint analyzes written content for a set of tones that is applicable to a broad range of uses. The Tone Analyzer service computes a scorecard that includes the following tones:

- **Emotional tone** is derived from IBM's work on emotion analysis, which is an ensemble framework that infers emotions from a text. To derive emotion scores from text, IBM uses a stacked generalization-based ensemble framework; stacked generalization uses a high-level model to combine lower-level models to achieve greater predictive accuracy. Features such as n-grams (unigrams, bigrams, and trigrams), punctuation, emoticons, curse words, greetings (such as "hello," "hi," and "thanks"), and sentiment polarity are fed into machine-learning algorithms to classify emotion categories.
- **Language tone** is calculated from linguistic analysis based on learned features.

NATURAL LANGUAGE UNDERSTANDING :

Watson Natural Language Understanding can analyze text and return a five-level taxonomy of the content as well as concepts, emotion, sentiment, entities, and relations. The new release of its syntax API feature allows users to extract much more semantic information within their content by leveraging tokenization, parts of speech, lemmatization, and sentence splitting.

Tokenization: Tokenization is the process in which sentences are segmented into words, phrases, or symbols called tokens. This is a crucial and necessary step that occurs prior to any data processing. Tokenization is essentially pre-processing one's data, identifying the basic units needed to be processed. Without these basic units, it is difficult to carry out an analysis of the content.

For Example :

"My email is abc1@example.org. What's yours?"

Tokenization:

[My][email] [is] [abc1@example.org] [.] [What] ['s] [yours] [?]

Lemmatization: Documents are going to have multiple versions of a word within the content — run and running, for example. These words and their different forms have similar meanings only in their simplest form. The goal of lemmatization is to reduce the complexity of these words and break down the word into its simplest form.

For Example:

“We are running several **marketing** campaigns in these **markets**.”

Lemmatization:

[We] [be] [run] [several] [**marketing**] [campaign] [in] [this] [**market**]

Parts Of Speech: After a phrase has been tokenized, each token is categorized by a certain part of speech. Watson Natural Language Understanding uses the universal parts of speech across all languages, including noun, verb, adjective, pronoun, punctuation, and proper noun. Parts of speech are extremely important when it comes to natural language processing. It can be used in word-sense disambiguation and understanding the intent behind each word within a sentence.

For Example:

"I am on break. Don't break anything."

Part of Speech tagging:

[I = PRON] [am = AUX] [on = ADP] [**break** = **NOUN**] [.=PUNCT]

[Do = AUX] [n't = PART] [**break** = **VERB**] [anything = PRON] [.=PUNCT]

Sentence Splitting: There will be multiple instances where users will have to know when a sentence stops and when the next one begins without being confused with a proper noun such as “Mr.” or “Mrs.” in the sentence. Watson Natural Language Understanding determines when a complete thought has been expressed in a sentence and can tell when that sentence ends and when the next one begins.

For Example:

"The price is \$9.99. It was \$19.99 last year."

Sentence Splitting:

“The price is \$9.99.”

“It was \$19.99 last year.”

Watson Natural Language Understanding extracts people, place, organizations and relationships from text to help you identify who, where and what is being talked about so that it can build knowledge bases and guide question-answering tasks.

For identifying specific people, places, and organizations, and what relationships they have with other things, Natural Language Understanding provides a set of: **Identifying Entities, Relations and Semantic Roles**.

Natural Language Understanding Entities are used to extract specific names of people, locations and organizations from text. The Entities feature will augment supertypes (such as company, person, job_title, organization, healthcondition) with subtypes, which can further enhance the understanding of the content as in the instance below where we see that CompanyFounder is a subtype of the supertype Person (Thomas J. Watson Sr.)

```
{
  "type": "Person",
  "text": "Thomas J. Watson Sr.",
  "relevance": 0.502033,
  "disambiguation": {
    "subtype": [
      "CompanyFounder"
    ],
    "name": "Thomas J. Watson",
    "dbpedia_resource": "http://dbpedia.org/resource/Thomas_J._Watson"
  }
}
```

Natural Language Understanding Relations has a pre-defined set of relationships between different entity types.

```
{
  "type": "partOfMany",
```


“sentence”: “In this program we will work closely with organizations (NGOs, public sector agencies, social enterprises) that are on the forefront of big societal challenges to learn and take inspiration from the problems they are tackling.”,

“score”: 0.411016,

“arguments”: [

{

“text”: “NGOs”,

“entities”: [

{

“type”: “Organization”,

“text”: “NGOs”

From this article, Relations has picked out that NGOs are part of many organizations as shown in the collective list of partners. The specificity of Relations can help map many different relationships between known and unknown entities.

Natural Language Understanding Semantic roles: The subject-action-object triples found by the API can describe what a certain noun is usually found doing, what sort of properties are usually ascribed to the subject, or even collect what someone has said on a certain topic. Semantic Roles can collect information about what entities are doing in articles across a corpus. Semantic Roles focuses on a specific verb as an action, and determines which phrases in the sentence are the most likely subject and object for the action.

“semantic_roles” :

{

“subject”: {

“text”: “IBM Health Corps”

},

“sentence”: ” Some of our recent initiatives include: P-Tech, where we are reinventing education by bringing together the best elements of high school, college and the professional world; Teacher Advisor, powered by IBM Watson, to support teachers in improving teaching and student achievement; The Jefferson Project, which deploys IoT and data analytics to protect fresh waters; and IBM Health Corps which helps partner organizations expand health access and improve outcomes with analytics and cognitive technologies.”,

“object”: {

“text”: “partner organizations expand health access and improve outcomes with analytics and cognitive technologies”

},

```
“action”: {  
  “verb”: {  
    “text”: “help”,  
    “tense”: “present”  
  },  
}
```

In this semantic roles sample from the article, the system has picked out that IBM Health Corps “helps” partner organizations. Gathering more free-form information like this across a corpus can help extract useful facts to draw conclusions in many domains.

3.2 Details of Hardware & Software:

The first thing to ensure is that you are on the right hardware. There is not much any one can do, if your hardware does not have what you would need. Laptops are the mainstream device for computing now a days, even desktop gives better configuration. Machine with quad-core processor, preferably i3 is to be used. Use maximum RAM size to the extent possible. A lot of tools use RAM for computations.

Hardware Requirements:

- 4GB RAM
- 32GB Hard disk
- I3 processor based Computer

Software Requirements:

- IBM Watson: Watson Assistant is a platform for building conversational interfaces into any application, device, or channel. It is a question-answering computer system capable of answering questions posed in natural language.
- Node.js: Node.js is an asynchronous event driven JavaScript runtime, designed to build scalable applications. It is an open-source, cross-platform, JavaScript run-time environment that executes JavaScript code outside of a browser.

3.3 Design details:

There are 3 important modules in the system:

1. **User**
2. **Front End** which consists of Chatbot API
3. **Back End** which consists of Chatbot Server

The Chatbot server contains IBM Watson Assistant, Watson Tone Analyzer, Watson Discovery.

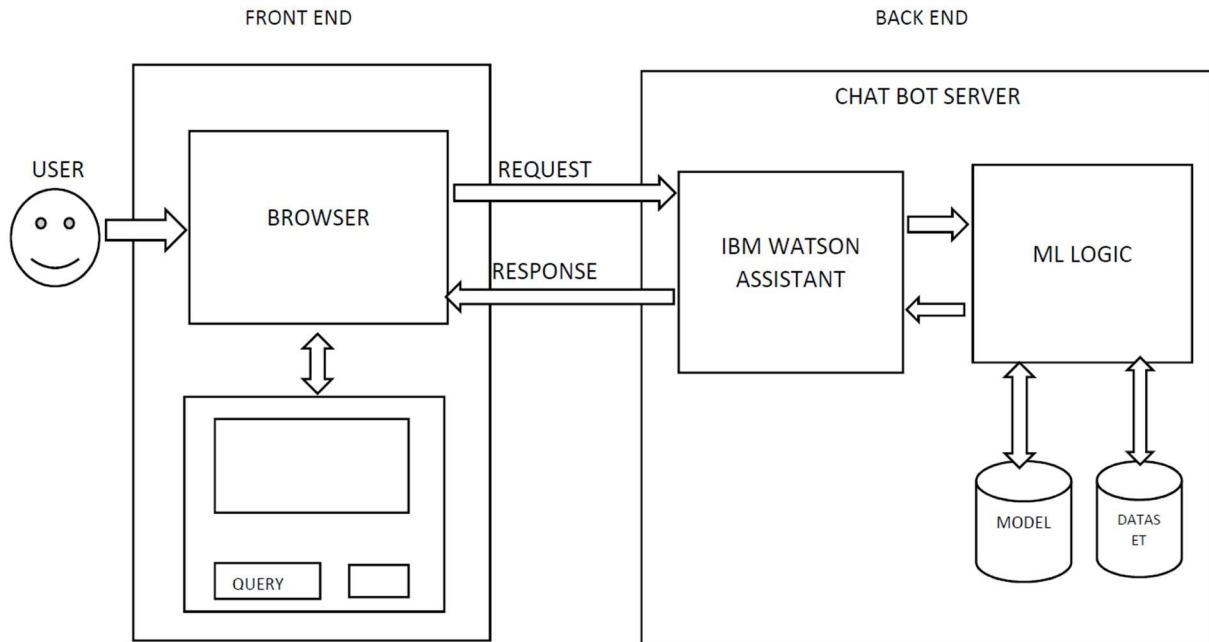


Fig. no. 3.3.1

UML Diagrams:

1. Entity Relationship Diagram:

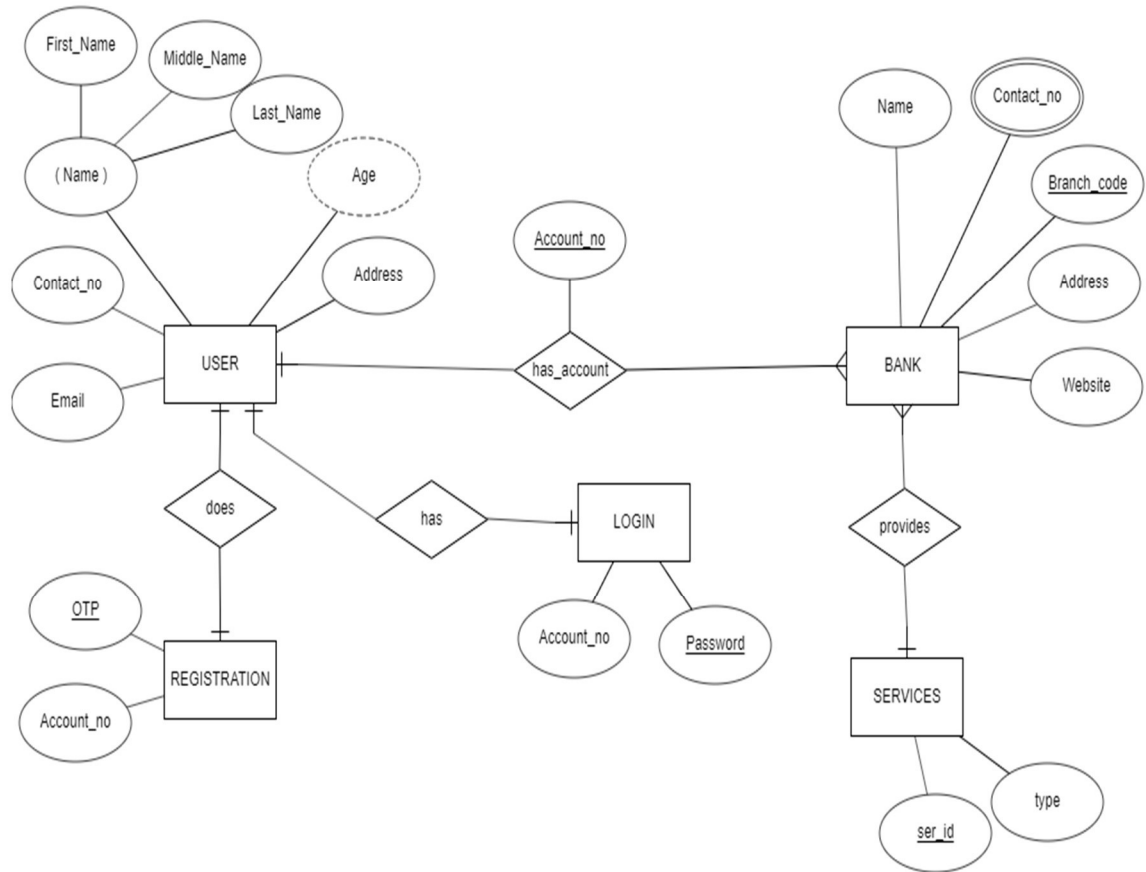


Fig. no. 3.3.2

2. Use Case Diagram:

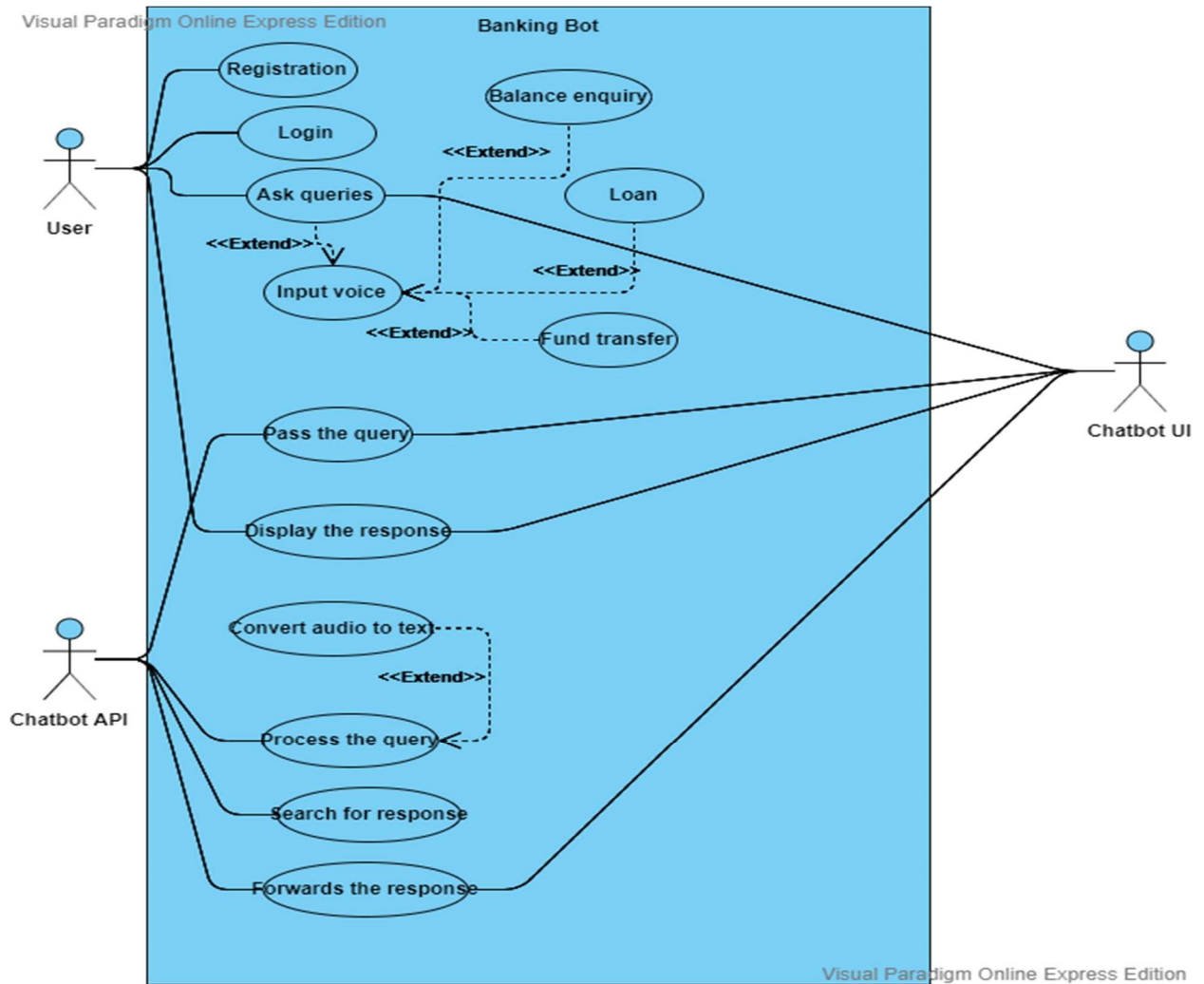


Fig. no. 3.3.3

3.Activity Diagram:

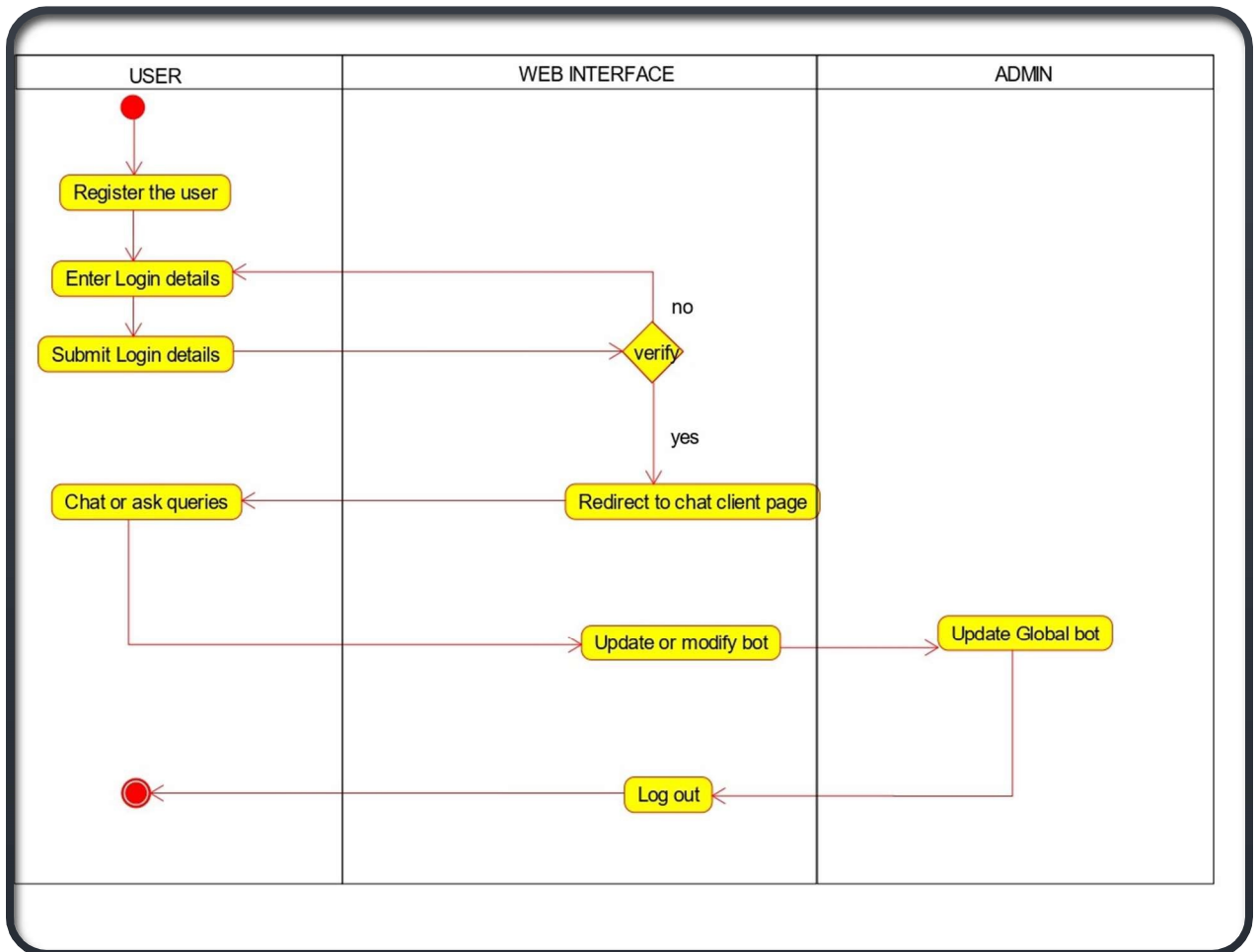


Fig. no. 3.3.4

4.Sequence Diagram:

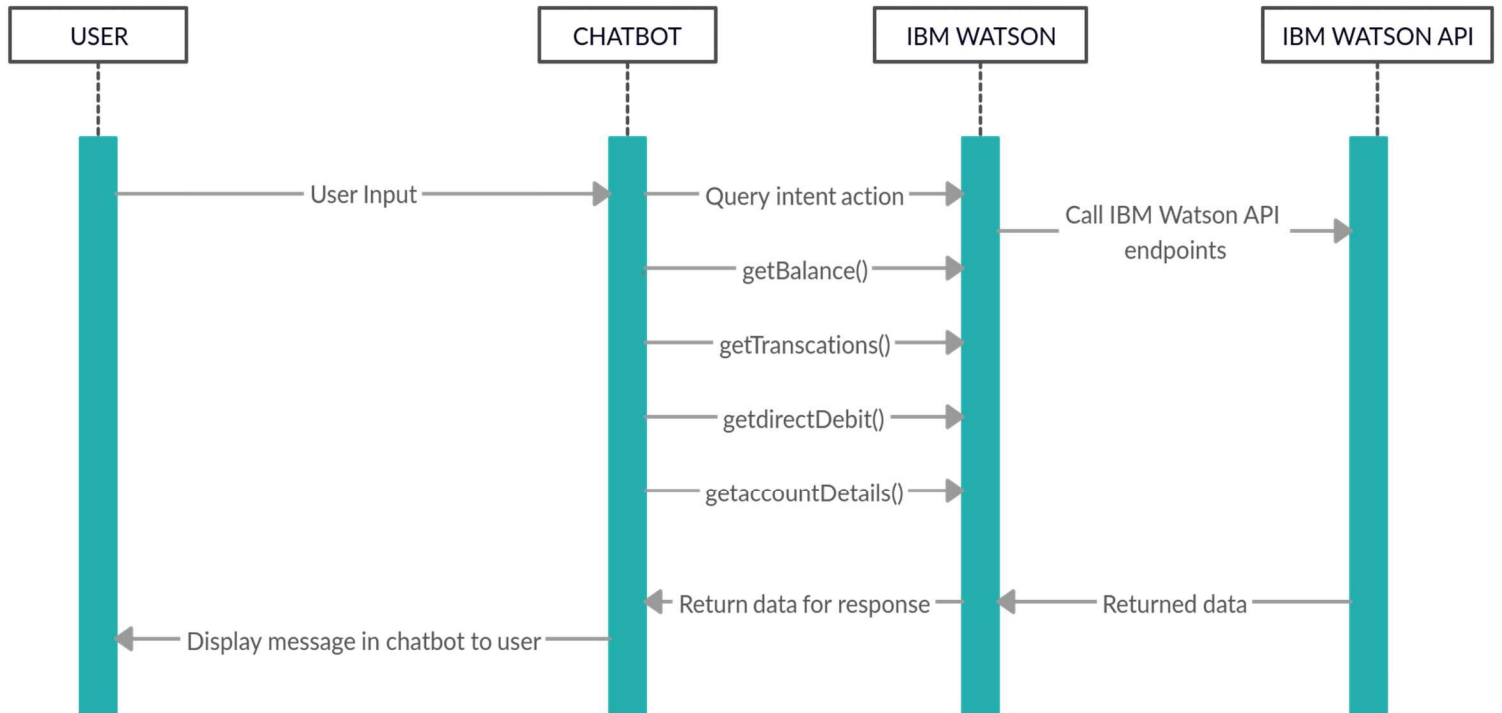


Fig. no. 3.3.5

5. Sequence Diagram for Log In:

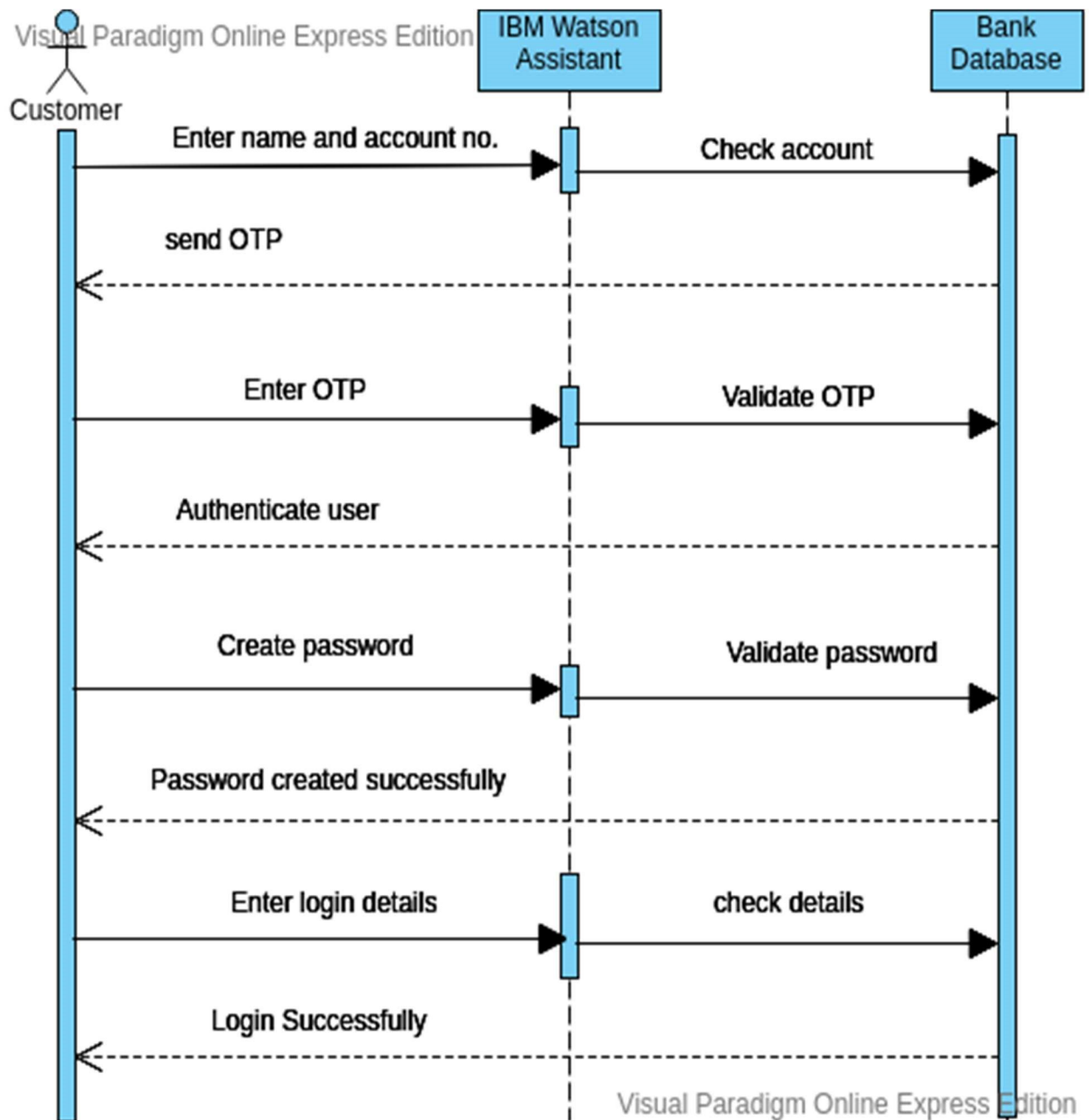


Fig. no. 3.3.6

6. Sequence Diagram for Funds Transfer:

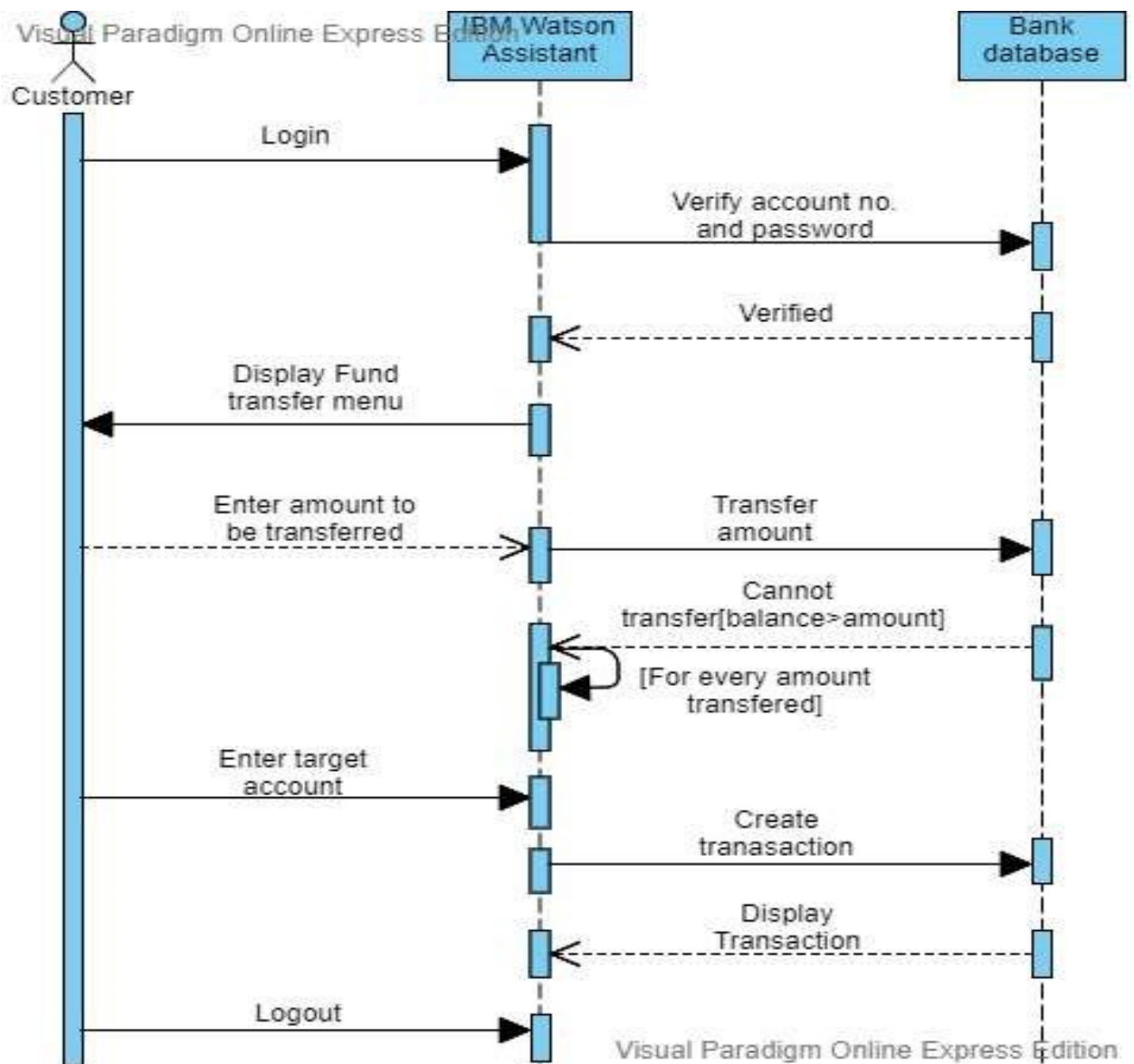


Fig. no. 3.3.7

7. Sequence Diagram for Loan Enquiry:

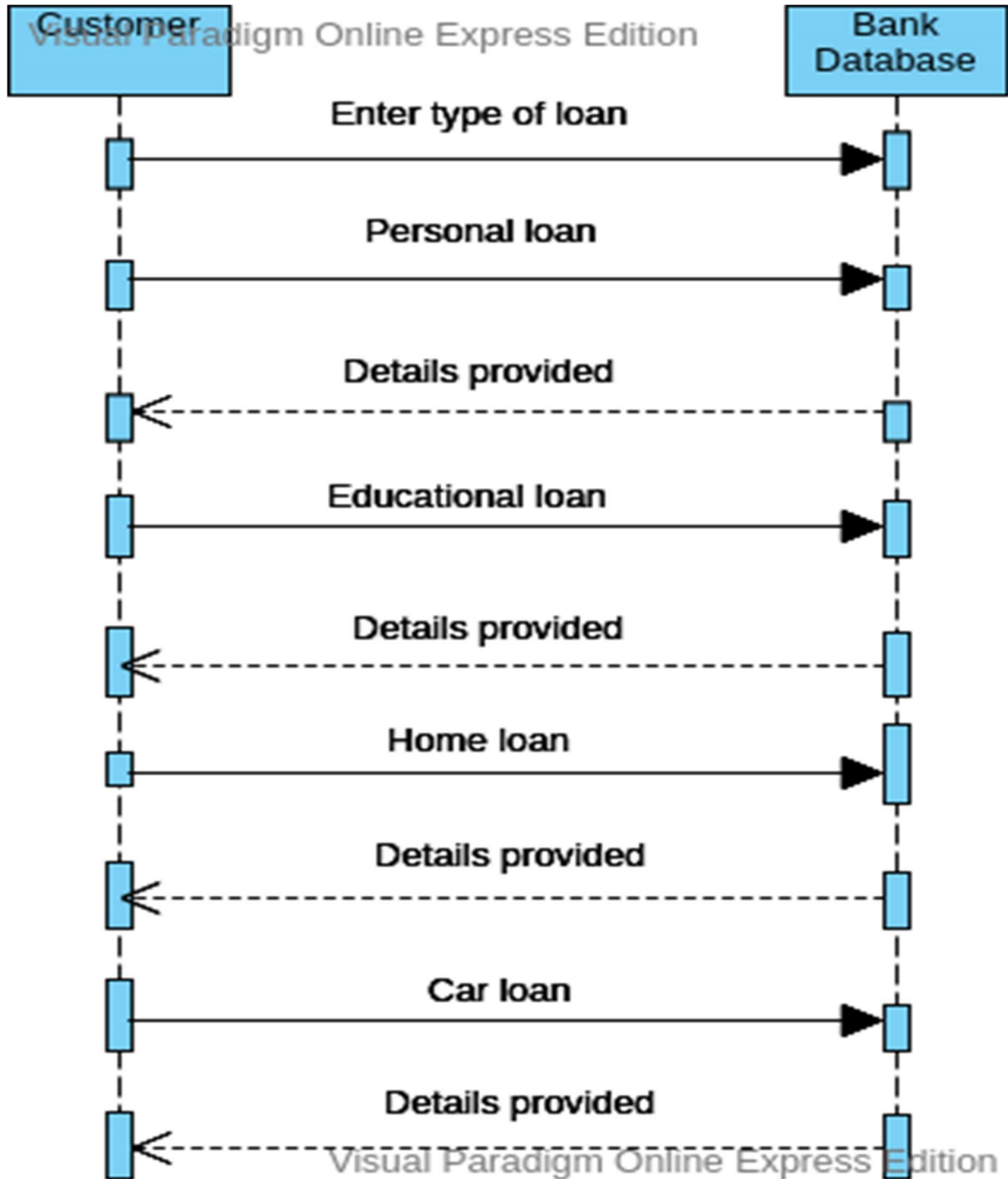


Fig. no. 3.3.8

8. Sequence Diagram for Account Details:

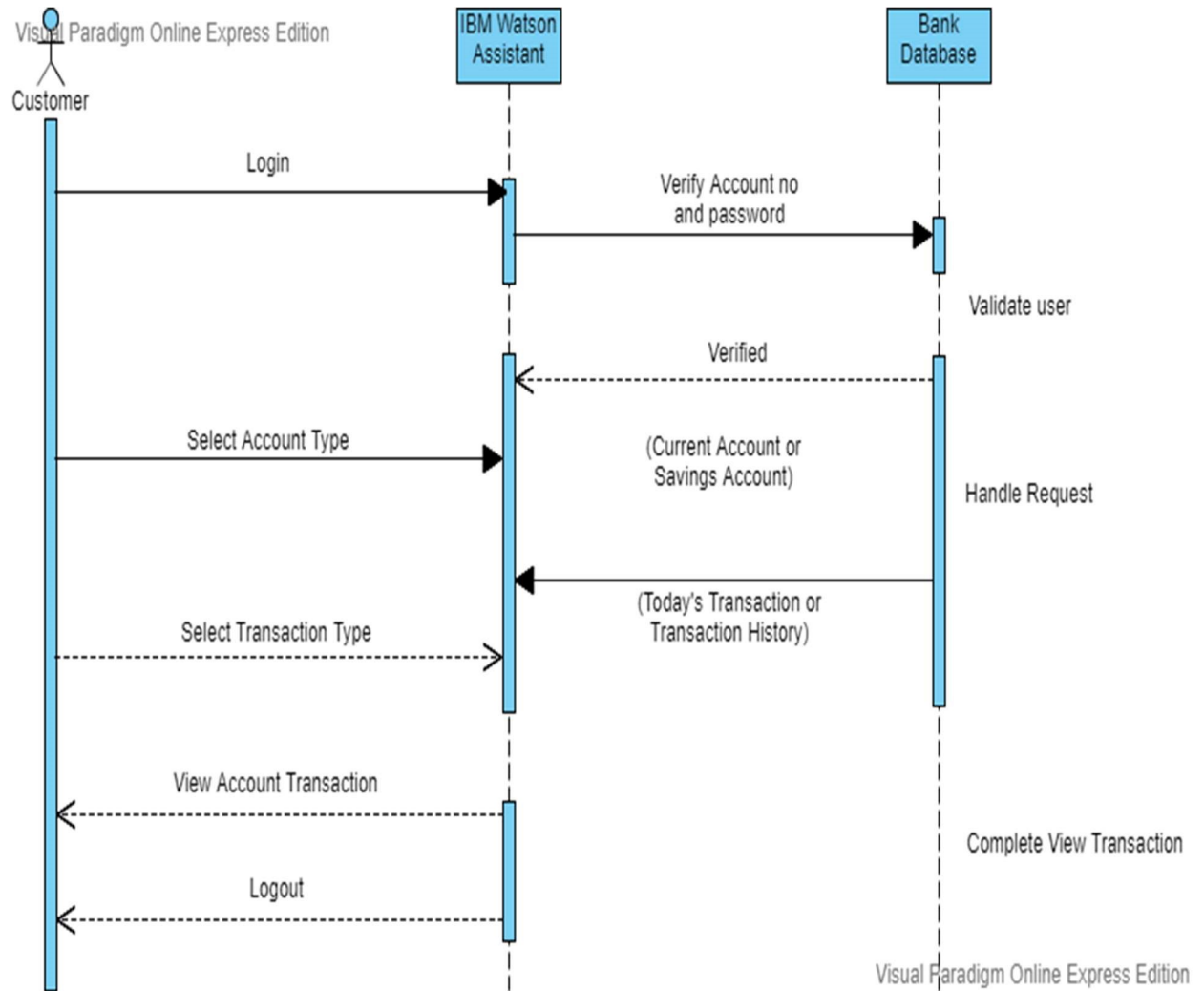


Fig. no. 3.3.9

9. Class Diagram:

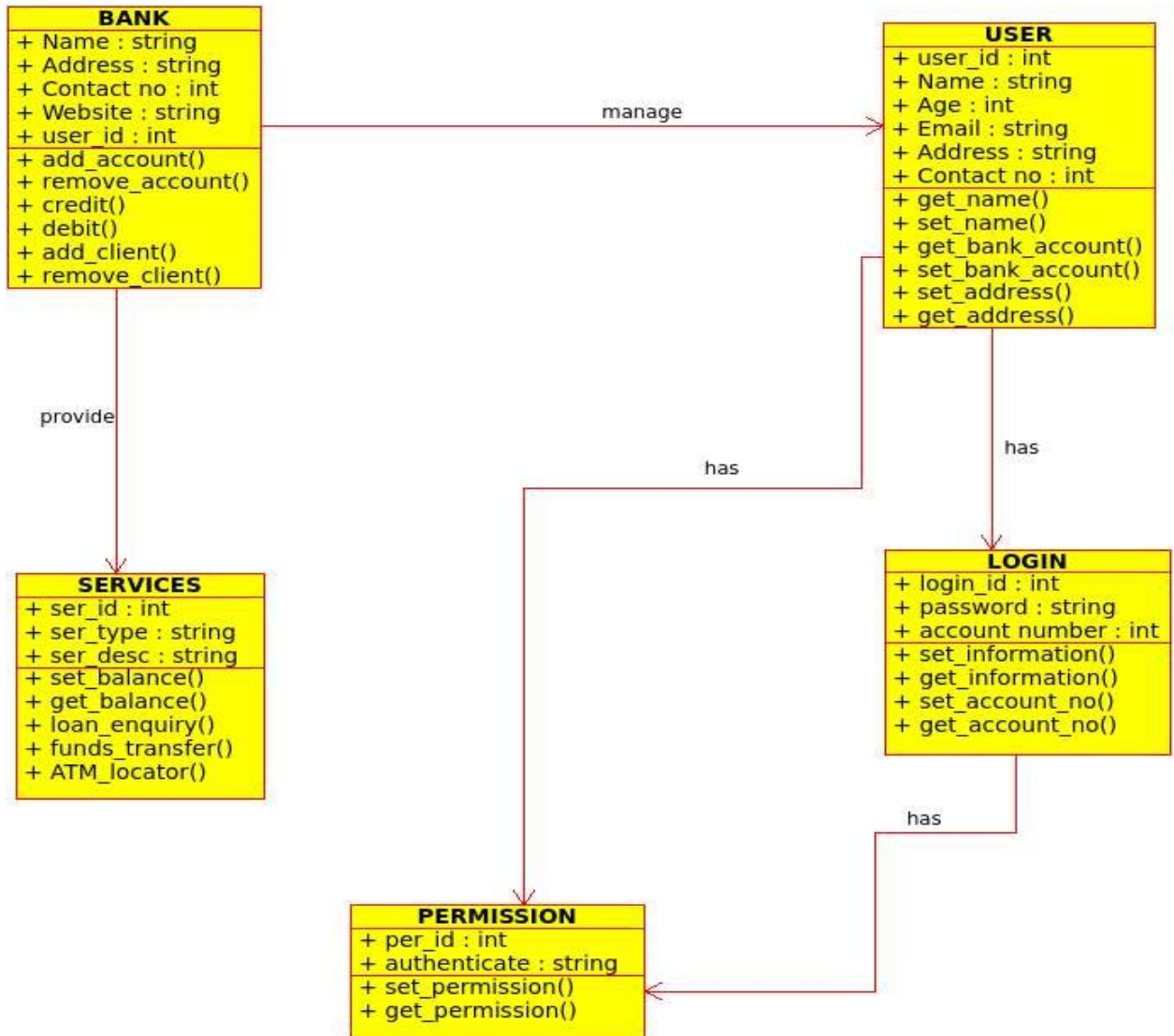


Fig. no. 3.3.10

3.4 Methodology:

In this we create a chatbot using Node.js and IBM Watson Assistant. The flow is enhanced by using Watson Natural Language Understanding to identify entities and Watson Tone Analyzer to detect customer emotions. For FAQs, a call to the Watson Discovery service uses passage retrieval to pull answers from a collection of documents.

Flow:

1. The FAQ documents are added to the Discovery collection.
2. The user interacts with a chatbot via the app UI.
3. User input is processed with Tone Analyzer to detect anger. An anger score is added to the context.
4. User input is processed with Natural Language Understanding (NLU). The context is enriched with NLU-detected entities and keywords (e.g., a location).
5. The input and enriched context is sent to Assistant. Assistant recognizes intent, entities and dialog paths. It responds with a reply and/or action.
6. Optionally, a requested action is performed by the app. This may include one of the following:
 1. Lookup additional information from bank services to append to the reply
 2. Use Discovery to reply with an answer from the FAQ documents

CHAPTER 4

CONCLUSION

We are going to implement an intelligent chatbot system for bank, which will give an appropriate response to user's query. Banking chatbot is an intelligent system which will think like human beings. This system will be helpful to reduce the workload of employees and increase the productivity of bank service and due to AIML files, accurate and quick answers will be given to user. Our system will take both voice as well as text as an input. If a person is not having knowledge about particular language, the system provides voice input facility. Therefore, the non-educated people can also easily interact with the bank system using voice input facility. We are going to provide effective GUI and animation, so that the users feel that he/she is talking with another person.

CHAPTER 5

REFERENCES

- 1) Chaitrali S. Kulkarni, Amruta U. Bhavsar, Savita R. Pingale, Prof. Satish S. Kumbhar, “BANK CHAT BOT – An Intelligent Assistant System Using NLP and Machine Learning” (IRJET), Volume:04, Issue 05, May 2017
- 2) Mr. Aniket Dole, Mr. Hrushikesh Sansare, Mr. Ritesh Harekar, Prof. Mithun Mane, “Intelligent Chat Bot for Banking System” (IJRASET), Volume 04, Issue 04, April 2016
- 3) Sarthak V. Doshi, Suprabha B. Pawar, Akshay G. Shelar, Shraddha S. Kulkarni, “Artificial Intelligence Chatbot in Android System using Open Source Program-O “ (IJARCCE), Volume 06, Issue 04, April 2017
- 4) <https://www.wired.com/2016/06/new-banking-ai-now-chatbots/>
- 5) <https://www.pwc.in/consulting/financial-services/fintech/fintech-insights/chatbot-the-intelligent-banking-assistant.html>
- 6) <https://www.google.com/search?q=objective+for+banking+chatbot&oq=objective+&aqs=chrome.69i59j69i57j0l2.2456j0j7&client=ms-android-oppo&sourceid=chrome-mobile&ie=UTF-8>
- 7) <https://botcore.ai/blog/basic-resources-required-build-enterprise-chatbot/>
- 8) <https://thefinancialbrand.com/71251/chatbots-banking-trends-ai-cx/>
- 9) <https://chatbotsmagazine.com/banking-chatbot-how-chatbots-can-improve-customer-experience-in-banking-af1deb78d2d>
- 10) <https://haptik.ai/blog/chatbots-in-banking-examples-best-usecases-future/>
- 11) <https://www.techechelons.com/blog/development-scope-in-chatbots-applications>