

Technological Institute of the Philippines - Quezon City
College of Computer Studies
Bachelor of Science in Computer Science

US Tourist Visa Eligibility Checker using
Rule-based, Fuzzy Logic, and Case-based reasoning

In Partial Fulfillment of the Requirement of the Course
CS 404 – Expert Systems

Presented by:

Eustaquio, Cyrill Kieron R. / BSCS
Fernandez, Aaron James / BSCS
Robias, John Maverick / BSCS
San Juan, Jean Carlo, M. / BSCS
Yap, Ethan Sancho / BSCS

Section:

CS32S2

Presented to:

Dr. Great Allan M. Ong
Instructor

Date of Submission:

May, 2024

US Tourism VISA Eligibility Checker

Introduction

International travel is the process of the crossing of borders from one country to another. It's a process that allows individuals to explore and experience the various different cultures and environments foreign countries have. Upon arrival in a foreign country, travelers are usually questioned by immigration officers. This is to verify the traveler's identity, validate the authenticity of their travel documents, and understand the purpose of their visit. This process is crucial for maintaining national security and ensuring that the traveler's intentions align with their stated purpose of visit.

The eligibility of a traveler to enter a country is evaluated based on various factors. These include the validity of their travel documents, their responses to the immigration officer's questions, and whether their intended activities in the country align with the type of visa they hold. This evaluation is necessary to ensure that only eligible and genuine travelers are granted entry. Once a traveler is deemed eligible, they are granted access to the country and its amenities. This includes public infrastructure, tourist attractions, and other facilities. This access is granted to allow the traveler to carry out their stated purpose of visit, whether it's tourism, business, study, etc.

The process described above is particularly prevalent in tourism. Tourists often have to provide detailed information about their planned activities, accommodations, and return plans. This is to ensure that they are genuine tourists and not intending to stay in the country illegally. Unfortunately some people misuse tourism as a route to immigrate illegally to another country. They may enter the country as tourists and then overstay their visa. This is a concern for many countries as it can lead to unauthorized work, exploitation of the illegal immigrants, and potential security threats. Therefore, the rigorous process of questioning, verification, and validation is necessary to prevent such issues.

Objective of the Study

In enhancing the efficiency and effectiveness of the complex processes that come with international tourism. The researchers proposed the development of an expert system, this system is designed to streamline the process by meticulously reviewing the necessary documents and inquiries from tourists, assessing their eligibility for entry into the United States. The decision to focus on the U.S. stems from its status as a major global tourist destination, attracting a high volume of tourists each year, and the complexity of its visa policies. These factors present a unique challenge and opportunity for the application of an expert system.

Through the implementation of this expert system, the researchers aim to achieve the following objectives:

1. **Simplify the Visa Application Process:** By providing clear, step-by-step guidance, we aim to simplify the visa application process, making it more accessible and less intimidating for applicants.
2. **Accelerate the Visa Application Process:** By automating the review of documents and inquiries, we can expedite the application process, saving applicants valuable time and resources.
3. **Enhance Information Accessibility:** Our system will serve as a reliable source of information, readily available to both new and seasoned travelers, ensuring they are well-informed and prepared for their journey.
4. **Increase Acceptance Probability:** By helping applicants accurately complete their applications and meet all necessary requirements, we aim to increase their chances of being granted a visa.
5. **Design a prototype** that could be expanded for production use in the future
6. **Apply** rule-based, fuzzy logic, and case-based reasoning for designing an expert system.

Methods and Analysis

Problem Definition

In general, the VISA application process can be complex and confusing, especially for first-time applicants. Individuals often struggle to understand the specific requirements for a tourist visa and whether they qualify. This leads to:

- **Wasted Time and Money:** Applicants spend significant time researching eligibility criteria and filling out applications that may ultimately be rejected. Visa application fees are non-refundable, so a rejected application represents wasted money.
- **Frustration and Anxiety:** The uncertainty surrounding eligibility can be stressful for potential visitors. Applicants may be unsure about their chances of approval, leading to frustration and anxiety.
- **Reduces future travel eligibility:** A denied VISA application can negatively impact an applicant's chances of approval for future applications. Consular officers may view a previous rejection as an indicator of increased risk.
- **Inefficiencies for Consulates:** Consulates receive a high volume of applications, many from individuals who may not be eligible. This creates a backlog and slows down processing times for everyone.

Knowledge Engineering

In the process of evaluating visa applications for tourism, the researchers meticulously gathered, verified, and organized essential information. The researchers employed the help of an expert in the field of law in validating the results of the expert system produced and relaying to them the requirements and the question immigration officers would ask of the traveler.

- **Knowledge Acquisition:** The researchers utilized online information to gather explicit, tacit, and implicit information regarding the process of applying for a VISA as a tourist. Furthermore like it was mentioned before, to acquire the knowledge needed to build the knowledge base. The researchers employed the help of Legal Advisor Maria Victoria San Juan-Andretta to verify and

validate the gathered information but also to further add on the information to the knowledge base with further insights on the topic.

- **Knowledge Identification examples**

The following are sample knowledge that has been acquired:

- Explicit (easily codified knowledge)
 - Passport must be valid 6 months after the end of the trip.
 - A person that has been banned from getting a US Citizenship is also banned from getting a B-2 VISA.
- Implicit (knowledge made available by an expert)
 - The variables that are considered for determining one's strength of ties to a country such as family, career, and personal assets.
- Tacit (from personal experience)
 - Determining the real intent of an applicant for traveling.
- **Knowledge Validation:** The evaluation process is conducted with the help of our legal expert Ms. Victoria San Juan-Andretta, Throughout the creation of the knowledge base she was a part of checking the criteria used by the system to evaluate each traveler eligibility to enter the country and its resulting decision after its evaluation, this includes the information it asks for and the resulting outcome it produces.
- **Knowledge representation**
 - The eligibility criteria are categorized into three groups.
 1. **General Eligibility** - Rule-based systems are well-suited for straightforward, deterministic criteria. In the context of visa eligibility, general rules can be established based on legal requirements, such as minimum income threshold and passport validity. These rules are explicit and can be encoded into a rule-based expert system.
 2. **Proving Strong Ties to Home** - Fuzzy logic is useful when dealing with imprecise or uncertain information. Establishing strong ties to one's home country is often subjective and context-dependent. Fuzzy logic allows for gradual membership in a category (e.g., "strong ties") rather than a binary yes/no decision.
 3. **Travel Itinerary** - Case Based Reasoning leverages past cases (similar situations) to make decisions. For travel itineraries, each case (located in the csv) becomes a valuable precedent. By comparing the current applicant's proposed itinerary with successful past itineraries, the system can recommend or evaluate the feasibility of the travel plan.

Inference Engine Design

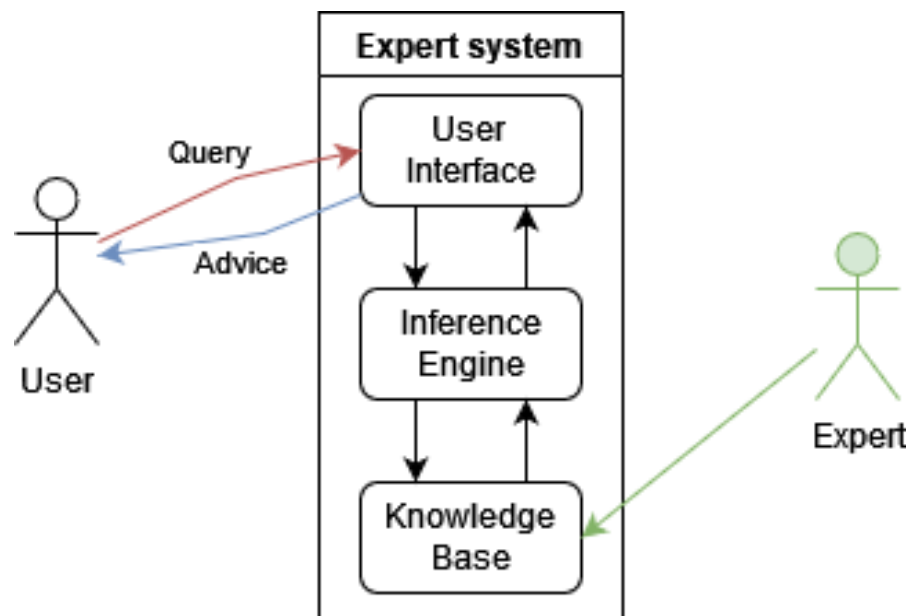


Fig. 1.0: Inference Engine Design

Architecture / Expert System Model

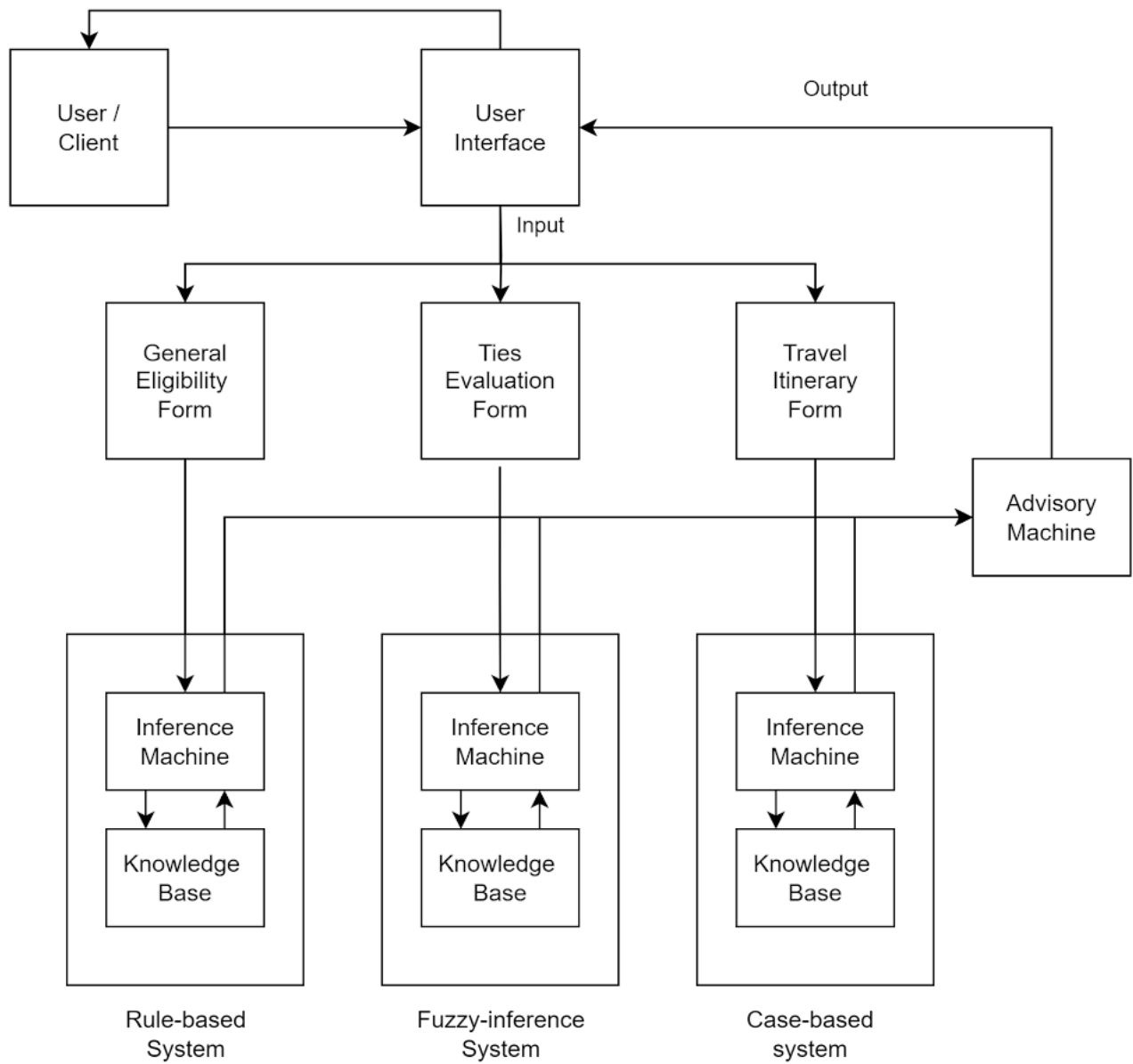
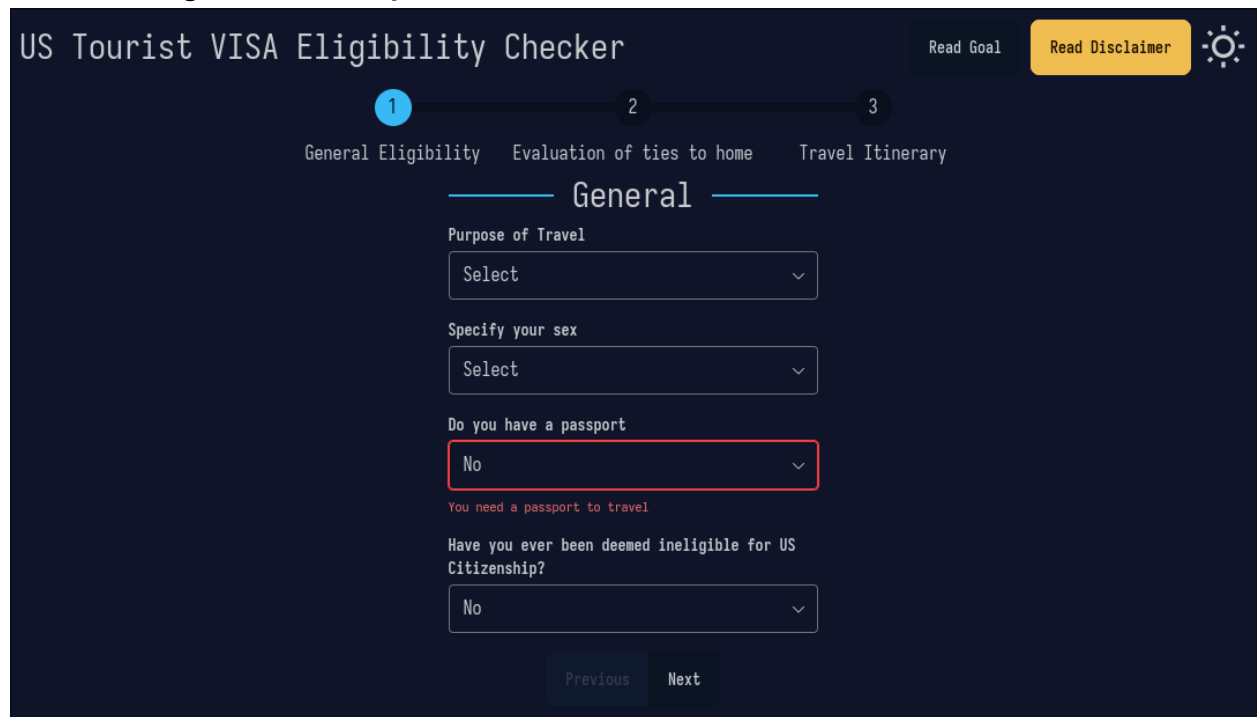


Fig. 2.0: Architecture/Expert System Model

Screen Design with Description



The image shows a web application titled "US Tourist VISA Eligibility Checker". At the top right, there are two buttons: "Read Goal" and "Read Disclaimer", followed by a settings icon. Below the title, a progress bar indicates three steps: 1 (General Eligibility, highlighted in blue), 2 (Evaluation of ties to home), and 3 (Travel Itinerary). The main heading "General" is centered. The form contains four questions, each with a dropdown menu:

- Purpose of Travel: Select
- Specify your sex: Select
- Do you have a passport: No (highlighted with a red border)
- Have you ever been deemed ineligible for US Citizenship?: No

Below the third question, a red error message states: "You need a passport to travel". At the bottom, there are "Previous" and "Next" buttons.

Fig. 3.0: General: Initial Screen

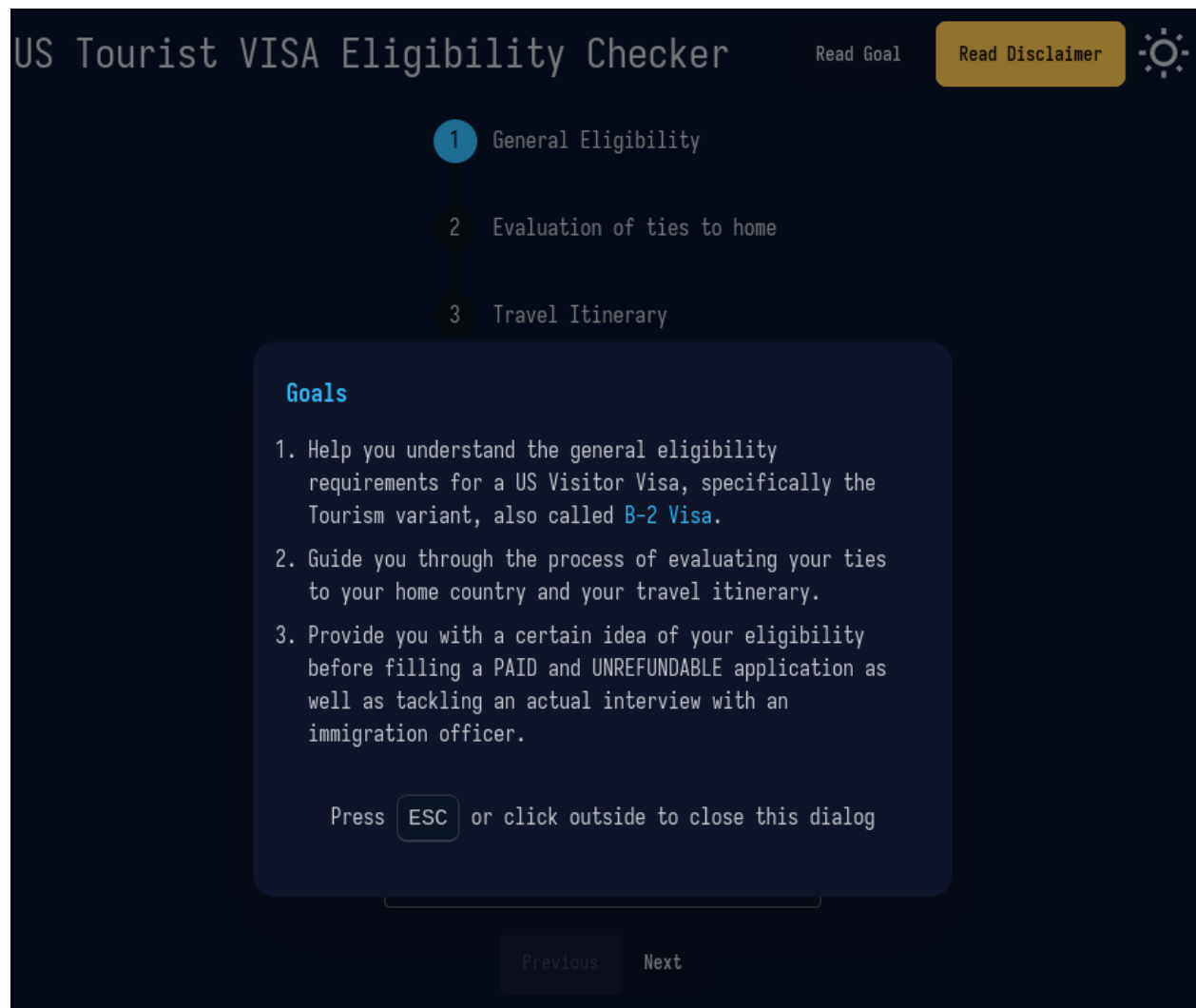


Fig. 4.0: Project Goals

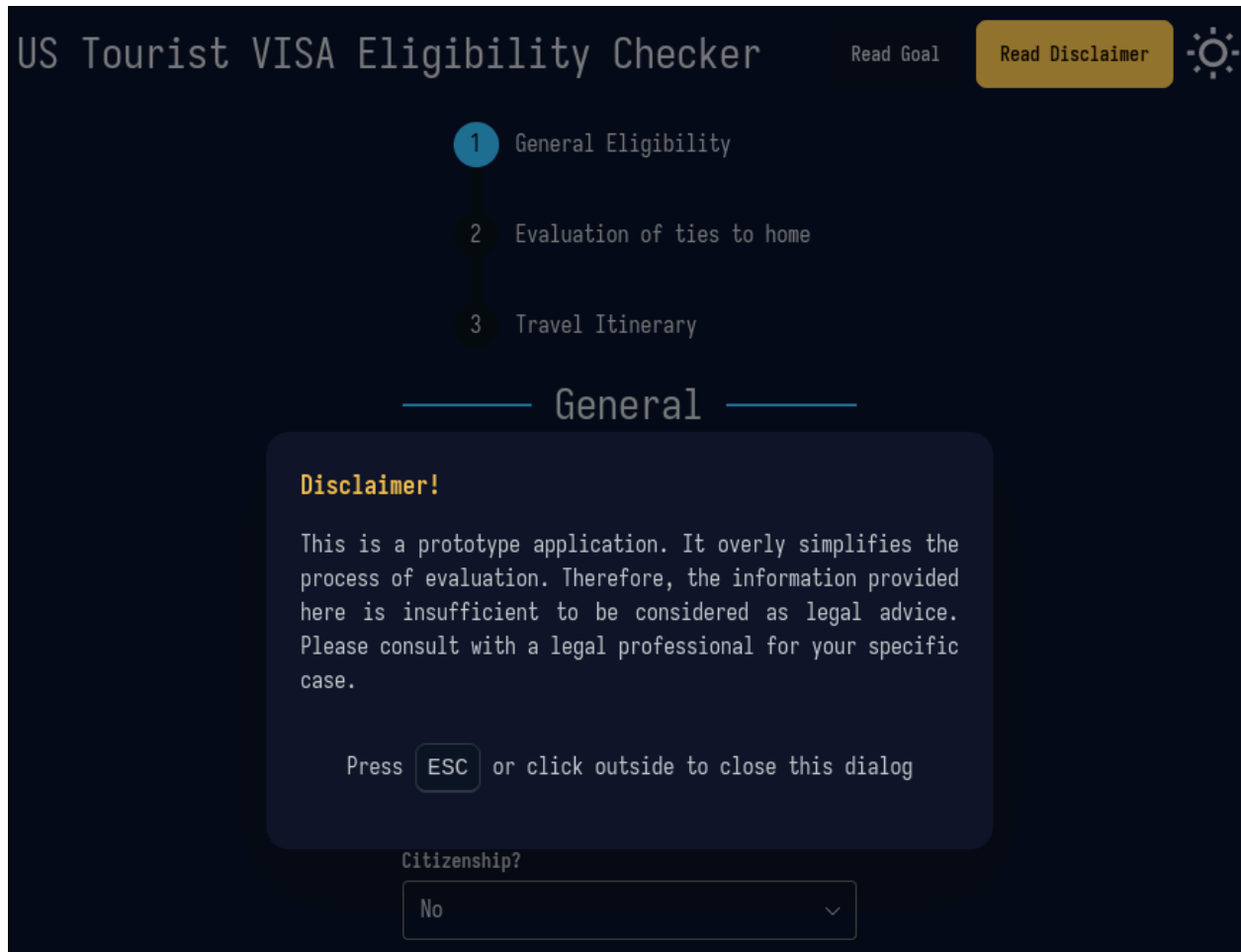


Fig. 5.0: Project prototype disclaimer

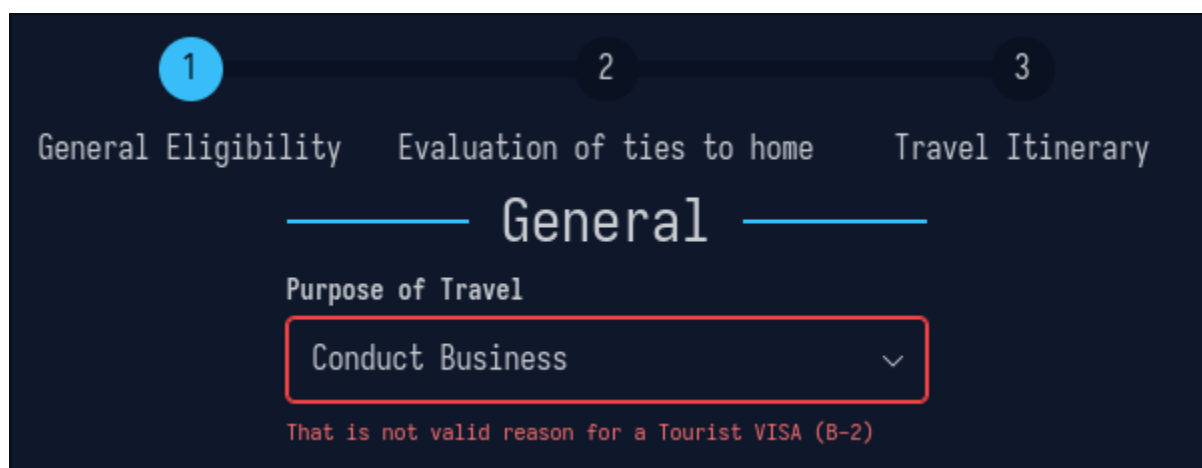


Fig. 6.1: General: Invalid purpose of travel

1 2 3

General Eligibility Evaluation of ties to home Travel Itinerary

General

Purpose of Travel

Visit with friends or relatives

Fig. 6.2: General: Valid reason of travel

Do you have a passport

Yes

What date will your trip start?

mm / dd / yyyy

What date will your trip end?

mm / dd / yyyy

Passport expiration date

mm / dd / yyyy

What date will your trip start? is required.

What date will your trip end? is required.

Passport expiration date is required.

Fig. 6.3: General: Follow up questions regarding a passport

Do you have a passport

Yes

What date will your trip start?

05 / 13 / 2024

What date will your trip end?

05 / 16 / 2024

Passport expiration date

05 / 20 / 2024

Your passport must be valid for at least 6 months after your trip ends

Fig. 6.4: General: Passport expiry

Have you ever been deemed ineligible for US Citizenship?

Yes

You are not eligible for a VISA. In general: Any immigrant who is permanently ineligible to citizenship is inadmissible.

Fig. 6.5: General: Ineligible for US Citizenship

Proving Ties

Montly Salary(\$)

2000

Are you married?

Yes

How many children

1

Are you enrolled in school?

No

How many countries have you visited?

1

Note: Excluding your home country

Fig. 7.1: Ties: Inputs for strong evaluation

Evaluation:

You have a/an

Strong

tie to your home country.

You scored

70%

in the evaluation.

Fig. 7.2: Ties: Strong evaluation

The screenshot shows a three-step process: 1. General Eligibility, 2. Evaluation of ties to home (highlighted), and 3. Travel Itinerary. The 'Proving Ties' section contains the following inputs:

- Monthly Salary(\$): 10000
- Are you married?: Yes
- How many children: 2
- Are you enrolled in school?: No
- How many countries have you visited?: 1

Note: Excluding your home country

Fig. 7.3: Ties: Inputs for very Strong evaluation



Fig. 7.4: Ties: Very strong evaluation

1

2

3

General EligibilityEvaluation of ties to homeTravel Itinerary

Proving Ties

Monthly Salary(\$)

0

Are you married?

No

Are you enrolled in school?

No

How many countries have you visited?

0

Note: Excluding your home country

Personal Assets

Asset name

Asset Type

Asset value (\$)

- Remove

Select Asset Type

+ Add asset

Organization Memberships

Organization name

Member since

Membership expiry

- Remove

mm / dd / yyyy

mm / dd / yyyy

+ Add organization

Fig. 7.5: Ties: Initial Screen



Fig. 7.6: Ties: Default evaluation

Monthly Salary(\$)

2000

This figure shows a dark blue input field for 'Monthly Salary(\$)'. The field contains the number '2000' and has a small up/down arrow icon on the right side.

Fig. 7.7: Ties: Ideal monthly salary



Fig. 7.8: Ties: Evaluation w/ ideal monthly salary

1 General Eligibility 2 Evaluation of ties to home

Proving Ties

Monthly Salary(\$)

0

Are you married?

Yes

Fig. 7.9: Ties: Being married



Fig. 7.10: Ties: Evaluation of being married only

Proving Ties

Montly Salary(\$)

2000

Are you married?

Yes

Fig. 7.11: Ties: Married with ideal salary results in acceptable evaluation

Proving Ties

Montly Salary(\$)

2000

Are you married?

Yes

How many children

1

Fig. 7.12: Ties: Married with ideal salary and having a child



Fig. 7.13: Ties: evaluation of the previous figure

Organization Memberships

Organization name	Member since	Membership expiry	
ACM	01 / 08 / 2024	12 / 06 / 2024	- Remove

+ Add organization

Evaluation:

You have a/an

Very weak

tie to your home country.

You scored

5%

in the evaluation.

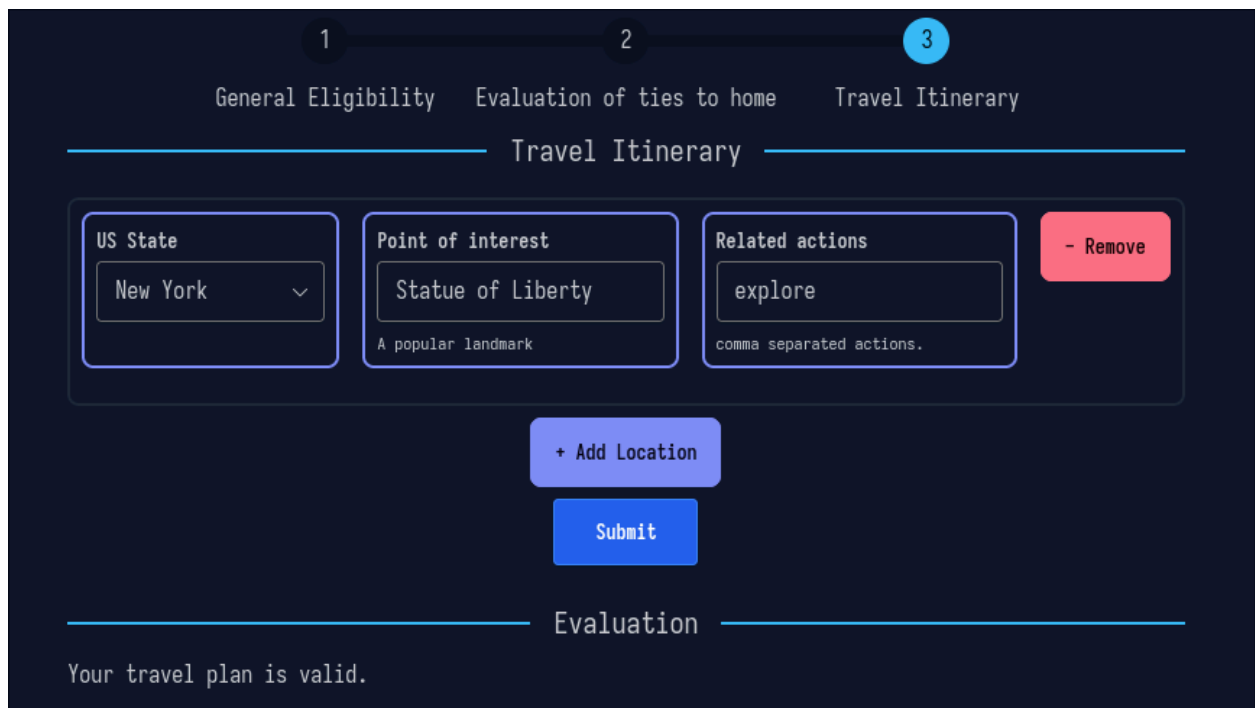
A horizontal progress bar is shown below the text, with the first 5% filled in red.

Fig. 7.14: Ties: Being only a member of an organization



The initial screen features a progress bar at the top with three steps: 1. General Eligibility, 2. Evaluation of ties to home, and 3. Travel Itinerary (highlighted in blue). Below the progress bar, the title "Travel Itinerary" is centered. The main form area contains three input fields: "US State" with a dropdown menu showing "Select a state", "Point of interest" with a text input field and a hint "A popular landmark", and "Related actions" with a text input field and a hint "comma separated actions.". To the right of these fields is a red "- Remove" button. Below the input fields are two buttons: a blue "+ Add Location" button and a blue "Submit" button.

Fig. 8.1: Travel: Initial Screen



The screen shows the same "Travel Itinerary" form as Fig. 8.1, but with the following data entered: "US State" is set to "New York", "Point of interest" is "Statue of Liberty", and "Related actions" is "explore". The "Submit" button is now highlighted in blue. Below the form, a new section titled "Evaluation" is visible, containing the text "Your travel plan is valid.".

Fig. 8.2: Travel: Valid plan given that user explores statue of Liberty in New York

Travel Itinerary

US State

New York

Point of interest

Statue of Liberty

A popular landmark

Related actions

swimming

comma separated actions.

+ Add Location

Submit

Evaluation

Anomalous Actions

Discrepancy in related actions:

• swimming

These actions are not application to any of your points of interests.

Fig. 8.3: Travel: Invalid action in the given landmark

Travel Itinerary

US State

New York

Point of interest

eiffel tower

A popular landmark

Related actions

explore

comma separated actions.

+ Add Location

Submit

Evaluation

Anomalous Points of interests

Discrepancies in the following location/s:

- eiffel tower

These do not exist in the given US states.

Fig. 8.4: Travel: Invalid plan given that the landmark does not exist in the given place

Travel Itinerary

US State

New York

Point of interest

yankee stadium

A popular landmark

Related actions

watch

comma separated actions.

+ Add Location

Submit

Evaluation

Anomalous Points of interests

Discrepancies in the following location/s:

- yankee stadium

These do not exist in the given US states.

Fig. 8.5: Travel: Landmark is absent from the cases in the knowledge base

Travel Itinerary

US State

New York

Point of interest

Statue of Liberty

A popular landmark

Related actions

dine

comma separated actions.

+ Add Location

Submit

Evaluation

Anomalous Actions


Discrepancy in related actions:

dine

These actions are not application to any of your points of interests.

Fig. 8.6: Travel: Action is absent from the cases in the knowledge base.

US Tourist VISA Eligibility Checker

[Read Goal](#)[Read Disclaimer](#)

1

General Eligibility

2

Evaluation of ties to home

3

Travel Itinerary

General

Purpose of Travel

Select

Specify your sex

Select

Do you have a passport

No

You need a passport to travel

Have you ever been deemed ineligible for US Citizenship?

No

Previous

Next

Fig. 9.0: Miscellaneous: Theme

References

- *Visitor Visa.* (n.d.).
<https://travel.state.gov/content/travel/en/us-visas/tourism-visit/visitor.html>
- *Important visa information - U.S. Embassy in the Philippines.* (2024, January 19). U.S. Embassy in The Philippines. <https://ph.usembassy.gov/important-visa-information>
- *RapidVisa.* (2021, August 5). *Strong Ties - RapidVisa® RapidVisa®.*
<https://rapidvisa.com/resources/strong-ties/>
-
- *Yializis, C.* (2024, March 22). *Getting a U.S. visa for a short, recreational or Part-Time study course.* www.nolo.com.
- <https://www.nolo.com/legal-encyclopedia/getting-us-visa-short-recreational-part-time-study-course.html>
- *Chapter 3 - U.S. Citizens at Birth (INA 301 and 309).* (2021, August 5). USCIS.
<https://www.uscis.gov/policy-manual/volume-12-part-h-chapter-3>

C E R T I F I C A T I O N

This is to certify that I have evaluated based on my experience that the program of the research titled “**US Tourist Visa Eligibility Checker using Rule-based, Fuzzy Logic, and Case-based reasoning**”

Name of Validator: Maria Victoria San Juan-Andretta

Highest degree attained: Bachelor of Laws

Institution affiliated: Cheyenne Regional Medical Center and Andretta Innovations LLC

Email address & Mobile #: marivicsanjuan@gmail.com +1 3072878009

Signature: *M.San Juan-Andretta*

Date: 05/07/2024 (PHT)

Project Contribution

Name	Contribution	Self-Evaluation 1-6 (6 is highest)
EUSTAQUIO, CYRILL KIERON R.	Research Documentation UI Design	6
FERNANDEZ, AARON JAMES	General Eligibility module Research Documentation	6
ROBIAS, JOHN MAVERICK	Documentation	6
SAN JUAN, JEAN CARLO M.	Main application Strong ties module Research Documentation	6
YAP, ETHAN SANCHO	Travel Itinerary module Research Documentation	6

Medical Diagnosis Expert System

Develop a system that can diagnose common illnesses based on symptoms provided by the user, providing recommendations for treatment or further consultation.

Educational Advising System

Create an expert system to help students choose their courses based on their interests, academic performance, and career goals.

Legal Advisory System

Build a system that provides legal advice or assistance on common legal issues, such as contract drafting, property disputes, or employment law.

Personal Finance Management System

Develop an expert system to help users manage their finances, providing advice on budgeting, saving, investing, and debt management.

Travel Planning Expert System

Create a system that assists users in planning their travel itineraries based on preferences, budget, and available options for transportation, accommodation, and activities.

Nutritional Advisor System

Build an expert system that provides personalized nutritional advice and meal planning based on individual dietary requirements, health goals, and restrictions.

Home Automation System

Develop an expert system that automates various tasks within a smart home environment, such as controlling lighting, temperature, security, and entertainment systems based on user preferences and schedules.

Crop Disease Diagnosis System

Create an expert system to help farmers diagnose and manage diseases affecting their crops, providing recommendations for treatment and prevention strategies.

Career Counseling System

Build a system that assists users in exploring different career paths, providing insights into job prospects, required skills, and educational pathways based on individual strengths and interests.

Language Learning Assistant

Develop an expert system to aid language learners in practicing grammar, vocabulary, and pronunciation, providing personalized feedback and suggestions for improvement based on the user's proficiency level and learning style.