SUMMER RESEARCH INTERNSHIP PROGRAMME - 2021

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PROJECT TITLE : Programming oriented Math-Art Work

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INTRODUCTION

In this project, we will be simulating the Card tricks with the power of programming in Python, and use them to showcase the Logic behind them.

Card Tricks have been always been a center of attraction in many magical shows. It always amaze the audience with its unpredictable outcomes and surprises everyone.

During the research Internship in “Programming Oriented Math-Art Work”, multiple such Card tricks were Demonstrated. The major idea is to show the hidden Math logic behind it. Few times it will be difficult for the viewer to figure out the reason behind the Card tricks.

In all the Card tricks, Math logics are used in one or other way somewhere. In this project I have worked on and Implemented 2 such Card Tricks.

Objectives of this Project

- Creating the Simulation of the working of the Card tricks using the python language to make the Card trick intuitive and easy to understand.
- To create a python library module, where it contains all the functions related to the cards, which can be used to implement many such Card tricks in the future.
- This project Can be given as an Assignment to the students who are interested in programming and designing the things.

ABSTRACT

The project deals with 2 famous Card tricks, which are taken from the Martin Gardner Book “Mathematics, Magic and Mystery”

The 2 Card tricks are

1.Mera Bharath Mahan Trick

2.Upside Down Trick

Mera Bharath Mahan Card trick is based on the “Chinese remainder Theorem” and Modulo Mathematics. This Card trick shows even after certain number of rotations by the volunteer on pair of decks the final order of cards arranged will be the same in both the decks.

Upside Down Card trick is based on the Basic Algebra. The 3 Cards which are Selected at starting will be kept in middle of the 3 different decks, and decks will be combined and the deck will be split into 2 alternative decks consisting of upside faced Cards and downside faced Cards. Then the same thing will be repeated with respect to the downside faced deck. At last, the remaining three cards will be the same three Cards which were Chosen by the Volunteer at Starting.

Implementation of “MERA BHARATH MAHAN’’ Card Trick

Description:

This trick is based on Chinese remainder Theorem and Modulo Mathematics. Magician consider 2 sets of 5 different Cards and divide it into two unique different piles. The volunteer will be given the chance to choose the pile for each letter in the phrase “MERA BHARATH MAHAN JAIHIND” to select the pile for shuffling (bringing the top card to the bottom of the pile). On Completion of each word in the phrase the Top Cards from both the piles will be removed and kept aside, and same thing will be repeated till the phrase gets over. At the end of the Card Trick the magician shows all the pair of the Cards which were kept aside. To the Surprise all the pairs will be matching with each other.

Steps for running the Animation:

- The simulation is implemented using the Python’s Pygame Library.
- After executing the application, a black screen will be seen where the user need to press the Enter at right side of the keyboard to continue.
- The window with 10 different Cards with 2 different sets can be seen, and the same is shown in Fig 1.1.

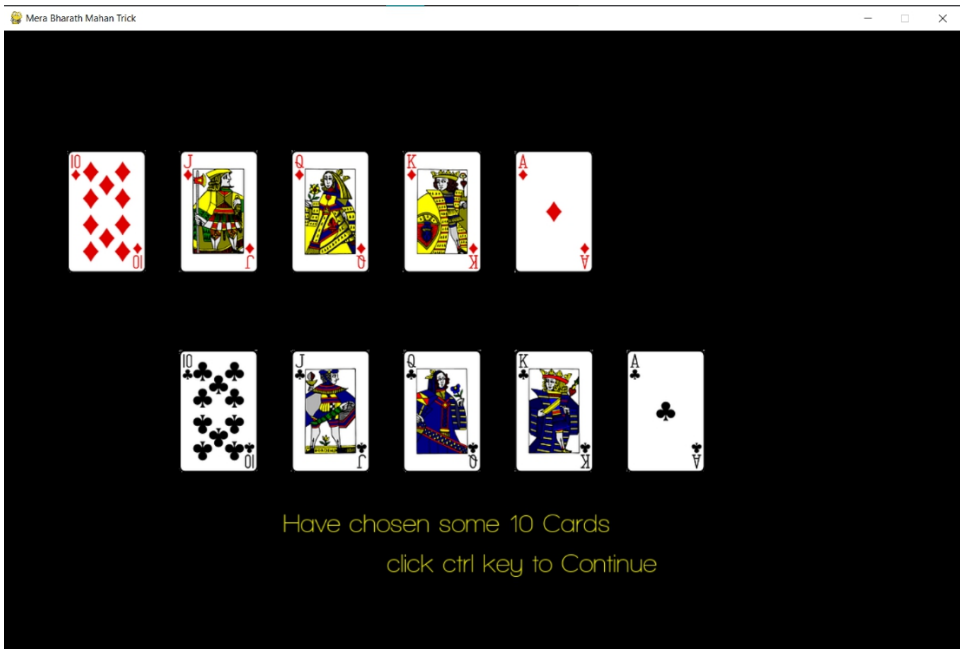

Fig 1.1

- Then press the right side ctrl key to continue, you will be seeing the same sets arranged in 2 different piles in vertical orientation, and the same is shown in Fig 1.2.

Fig 1.2

- Use your left and right Arrow keys to choose the pile and to shuffle the cards(moving the card from the top to bottom of the pile) and the same transitions of the cards while shuffling is shown in the Fig 1.3.

Fig 1.3

- At the End of each word in the phrase, user need to press the space button to remove the top cards from both the piles and to place that pair aside and the same thing can be done till the cards get finished.
- At last, the pairs will be same as of each other and same is shown in Fig 1.4.

Fig 1.4

- The user has the complete power to select the piles to shuffle in any order, but the pairs will remain matched always.

Implementation of “UPSIDE DOWN” Card Trick

Description:

This trick is based on Basic Algebra. Volunteer chooses the 3 Cards from the deck of 52 Cards. Then the remaining cards will be split into 3 decks of 10,15,15 cards respectively and remaining deck of 9 cards will be kept aside. One Card from 3 cards will be placed on the first deck of 10 cards and some random no. of cards chosen from the second deck by the volunteer will be placed on the first deck. The same will be repeated with the second deck as well, one of the card from 2 cards will be chosen and placed on the second deck and some random no. of cards will be chosen by the volunteer from the third deck and will be placed on the second deck and remaining card from 3 cards will be placed on the third deck and remaining deck of 9 cards will be placed on the third deck. All the decks were merged into one and starting 4 cards will be placed at the bottom. Then the deck of Cards will be divided into 2 decks alternatively placing the Cards up and down in each different deck. The same thing will be repeated with the deck of cards with downside face Continuously. At last volunteer will be left with the 3 cards and those 3 cards are nothing but the same 3 cards which he chosed at starting.

Steps for running the Animation:

- The simulation is implemented using the Python’s Pygame Library.
- After executing the application, a black screen will be seen where the user need to press the Enter at right side of the keyboard to continue.

- After pressing the Enter button, some 3 Cards will be selected randomly and shown on the top of the screen, user can remember those Cards and the remaining 49 cards will be divided into decks of 10,15,15 respectively and remaining 9 cards will be kept aside and same is shown in the Fig 2.1.

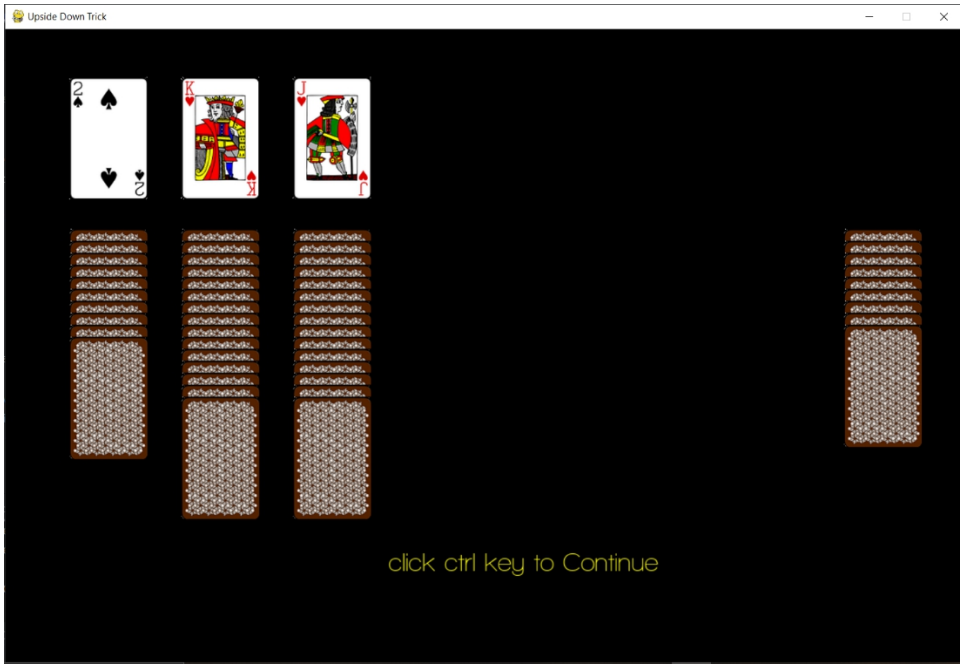

Fig 2.1

- User need to press the right side Ctrl button to shift the card from the top and to place it on the deck and left arrow button to move the cards from one deck to other deck.
- Using the above mentioned method we will be moving the 1st card from the 3 cards on to the top of the first deck and we will be moving random no. of cards from second deck to the top of the first deck.
- In the same way we will be moving the 2nd card from the 3 Cards on to the top of the second deck and moving some random no. of cards from third deck to the second deck according to the user wish.

- We will be moving the last card onto the top of the third deck and we will be placing the deck of 9 cards onto the top of the third deck and the same is shown in the Fig 2.2.

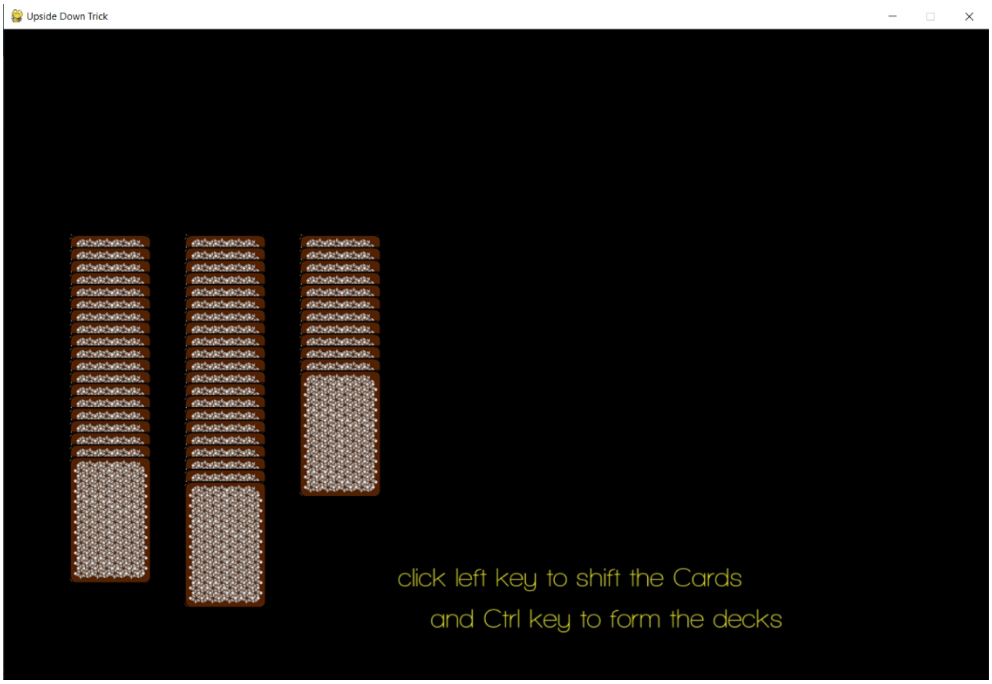

Fig 2.2

- Then on hitting the ctrl button the first deck will be placed on the right side and again hitting the ctrl will place the second deck on the first deck and hitting ctrl again will place the third deck on the second deck, and the same can be shown in the Fig 2.3.

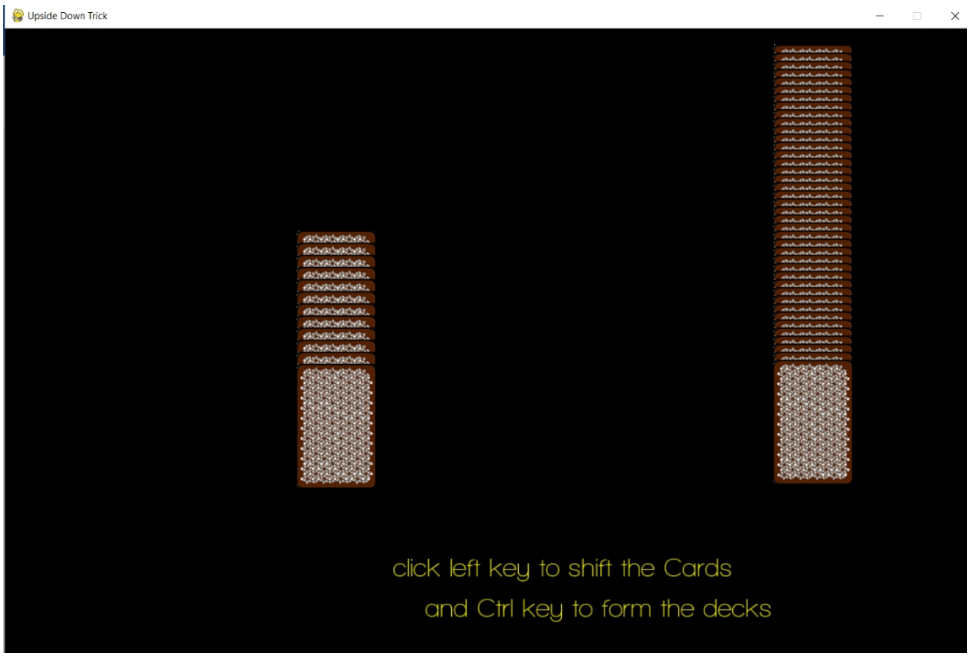

Fig 2.3

- On pressing the ctrl again will remove the 4 cards from the top and place it to the bottom, which can be shown in the Fig 2.4.

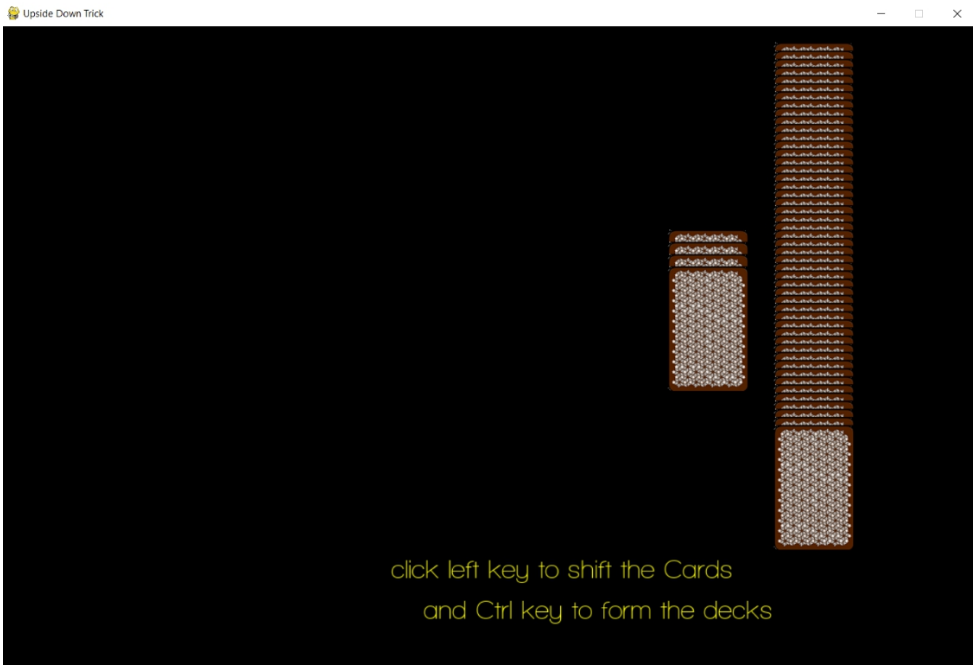

Fig 2.4

- Pressing the Ctrl key will now divide the complete deck into 2 different decks. One deck consisting of all the cards upside faced and other deck consisting of all the cards downside faced which got divided alternatively, as shown in the Fig 2.5.

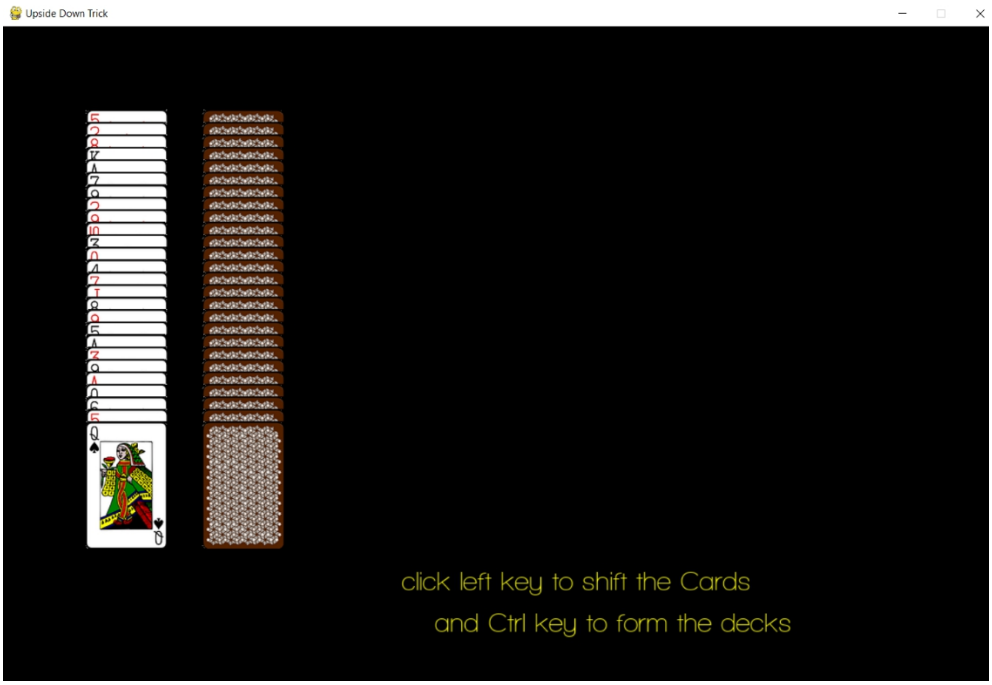

Fig 2.5

- On pressing the ctrl continuously the downside cards will be split into 2 decks repeatedly, one deck consisting of upside faced cards and other deck consisting of downside faced cards.
- At last there will be only 3 cards left, on pressing the ctrl key the 3 cards will be enlarged and shown separately, and those cards are nothing but the cards that user remembered at starting, and the same is shown in the Fig 2.6.

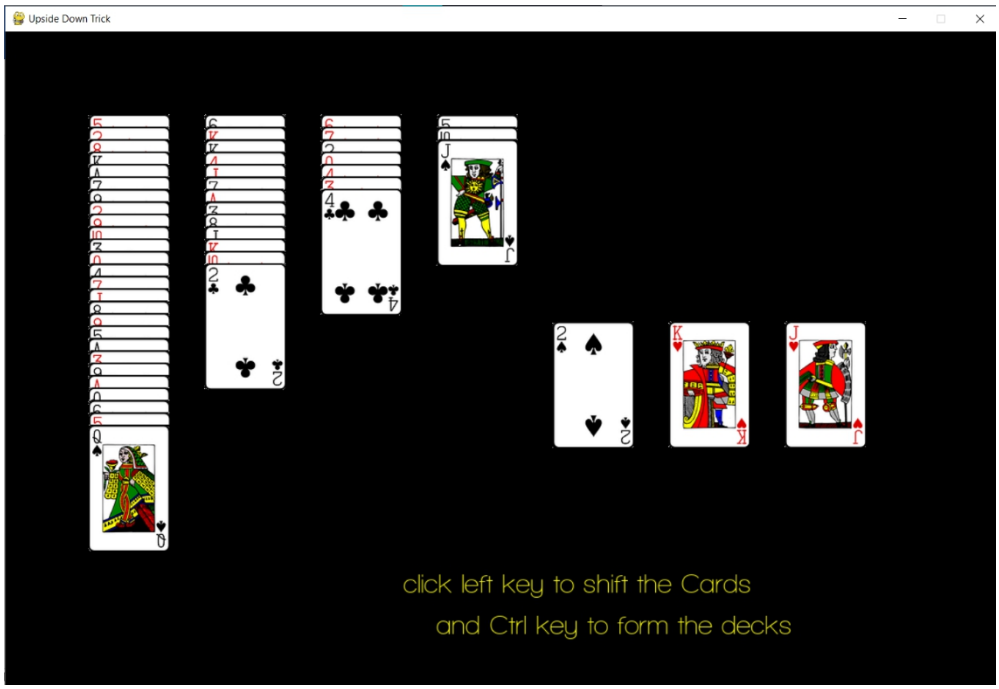

Fig 2.6

- User will be given the Complete power to shift as many cards as he want, to shift from one deck to other, but at ending the three cards won't differ from the starting Cards.

CONCLUSION:

This project gives the good understanding on the concepts like Programming and Mathematics, as the project dealt with it. Overall it was a good experience working on this project as it gave many insights on the programming and the Math logic which was not known before and it Increased the curiosity to learn many more Math tricks like that.