

IntelliSudoku: The AI-Powered Sudoku Solver

Presented By:

Samarth Mitesh Soni (200303105163)

Koushal Thakur (200303105190)

Gurkirat Singh (200303105204)

Ganta Shanmukha (200303105179)

Guided By:

Rajdipsinh Vaghela

Designation

CSE Department

PIET, Parul University

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Introduction

- Welcome to the presentation on "IntelliSudoku: The AI-Powered Sudoku Solver."
- Sudoku is a popular logic-based puzzle that requires filling a 9x9 grid with digits from 1 to 9.
- We have developed an intelligent system called IntelliSudoku that leverages AI algorithms to solve Sudoku puzzles efficiently.
- The AI-powered solver aims to reduce the time and effort required to solve Sudoku puzzles, making it an enjoyable and accessible experience for users of all skill levels.

Problem Statement

- The problem at hand is the laborious and time-intensive nature of solving Sudoku puzzles manually. Traditional methods rely on trial-and-error, tedious logic deductions, and manual backtracking, which can be frustrating for users. The challenge is to design and implement an AI-based system, IntelliSudoku, that can intelligently solve Sudoku puzzles and provide an interactive and efficient solving experience.

Summary

Sr. number	Paper Title	Publisher	Year	Take-away points
1	Sudoku Image Recognition	Sang C. Suh , Aghalya Dharshni Manmatharaj	2012	Image Recognition
2	Camera-based OCR	B. Wicht and J. Hennebert	2020	Optical Recognition Character
3	Image Processing Techniques	P. Simha, K. Suraj, T. Ahobala	2016	Process Digital Image
4	Deep Belief Network (DBN)	H. Lee, R. Grosse, R. Ranganath, and A. Y. Ng,	2018	Face Recognition
5	Digit Recognition	P. Simha, K. Suraj, and T. Ahobala	2017	Digit Recognition

Sr. number	Paper Title	Publisher	Year	Take-away points
6	Pencil and Paper Method	Perez, M. and Marwala, T	2019	Algorithm Test
7	Backtracking method	Chi E. & Lange K.	2018	Backtracking Algorithm
8	Hybrid Genetic Algorithm with Simulated Annealing (HGASA	Cantú-Paz, E. & Goldberg, D.E	2021	Scheduling Program
9	The Hybrid Backtrack And Pencil & Paper Method	Van Laarhoven, P. & Aarts	2022	the Pencil and paper method is applied to obtain the solution, otherwise it backtracks.
10	Evaluating The Hybrid Backtracking And Pencil And Paper (HBPnP)	Van Laarhoven, P. & Aarts, E	2018	solves all valid puzzles

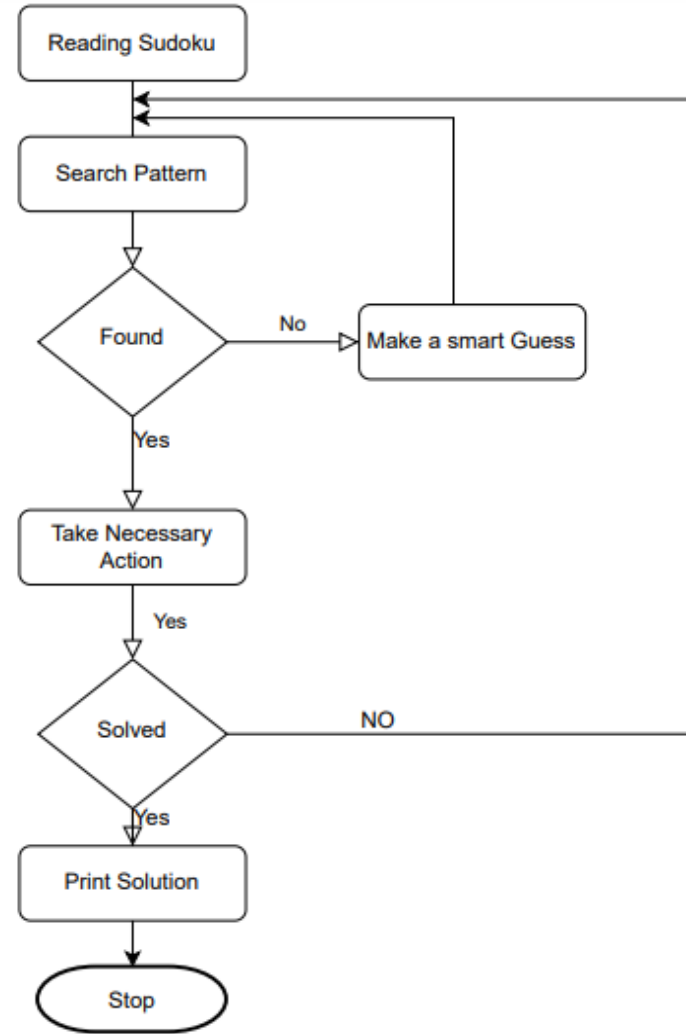
Sr. number	Paper Title	Publisher	Year	Take-away points
11	UDMS: User Data Management System Using Firebase Cloud	Sanket S. Kolte, Ekansh H. Mounderkar, Vipul R.	2017	Model of data Storage
12	An Implementation of Room Persistence Library in Android Local Database	Jaspreet Singh, Mr. Rachhpal Singh, Mrs. Balwinder	2016	Android databases and study of different types of databases to be used in android devices
13	CORE: A real-time network emulator	Jeff Ahrenholz, Claudiu Danilov, Thomas R. Henderson & Jae H. Kim	2014	Compared with other emulation, simulation, and virtualization tools
14	OTP-Based Two-Factor Authentication Using Mobile Phones	Mohamed Hamdy Eldefrawy, Khaled Alghathbar, Muhammad Khurram	2017	Infinite OTP generation using two nested hash functions.
15	Apply Android Studio (SDK) Tools	Hana R. Esmaeel	2019	Running and debugging Android applications virtually

Sr. number	Paper Title	Publisher	Year	Take-away points
16	Effectiveness Criteria for Internet Payment Systems	Tae Hwan. Shon and Paula M. C. Swatman	2020	The matter of net Payment Systems (IPS)
17	A Review on Firebase (Backend as A Service) for Mobile Application Development	Prachi R. Saraf, Sakshi M. Jadhao, Saurabh J. Wanjari & Shital G. Kolwate	2014	Firestore is a BaaS service from Google
18	Security of Database System	Abdulrahman Hamed Almutairi & Abdulrahman Helal Alruwaili	2017	Protect databases from malicious cyber-attacks
19	Augmented Reality on Sudoku Puzzle using Computer Vision and Deep Learning	Michael Nielsen	2018	A full fledged system for showing the solution of a Sudoku puzzle as Augmented Reality was proposed in the paper
20	Computer Vision based Sudoku Solving with Augmented Reality	Perez, M., Marwala, T	2016	It detects the Sudoku, recognizes the digits, solves it, and projects the result back

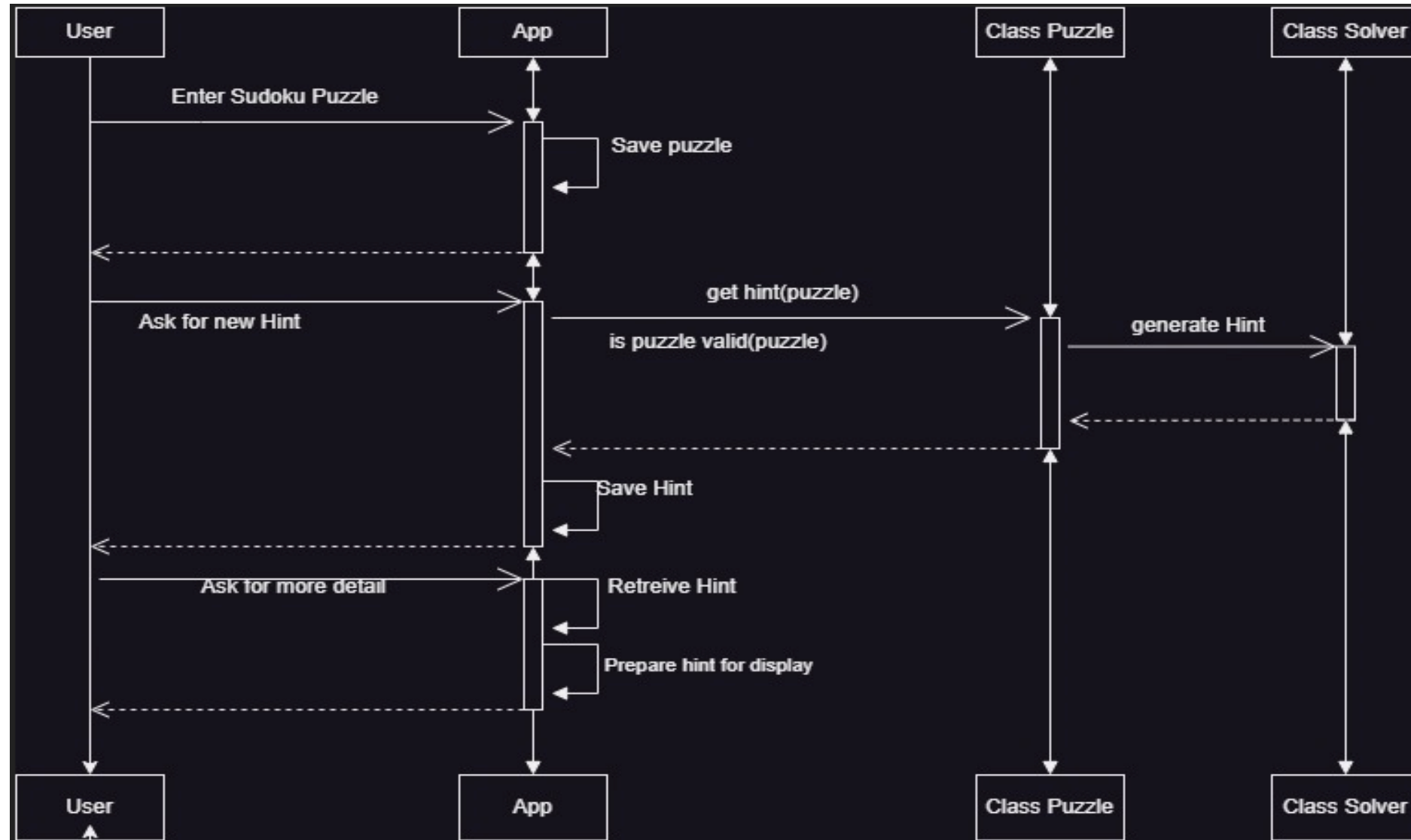
Flowchart of the system

- Start
- User Input:
 - Receive the Sudoku puzzle input from the user
 - Validate the input for correctness and format
 - If the input is invalid, display an error message and return to the User Interface step
- Sudoku Solver:
 - Apply the AI algorithm to solve the Sudoku puzzle
 - Implement constraint satisfaction, logical deductions, and backtracking techniques
 - Continuously check for progress and make logical deductions
 - If a contradiction is detected, backtrack and explore alternate paths
 - Repeat until the puzzle is solved or deemed unsolvable

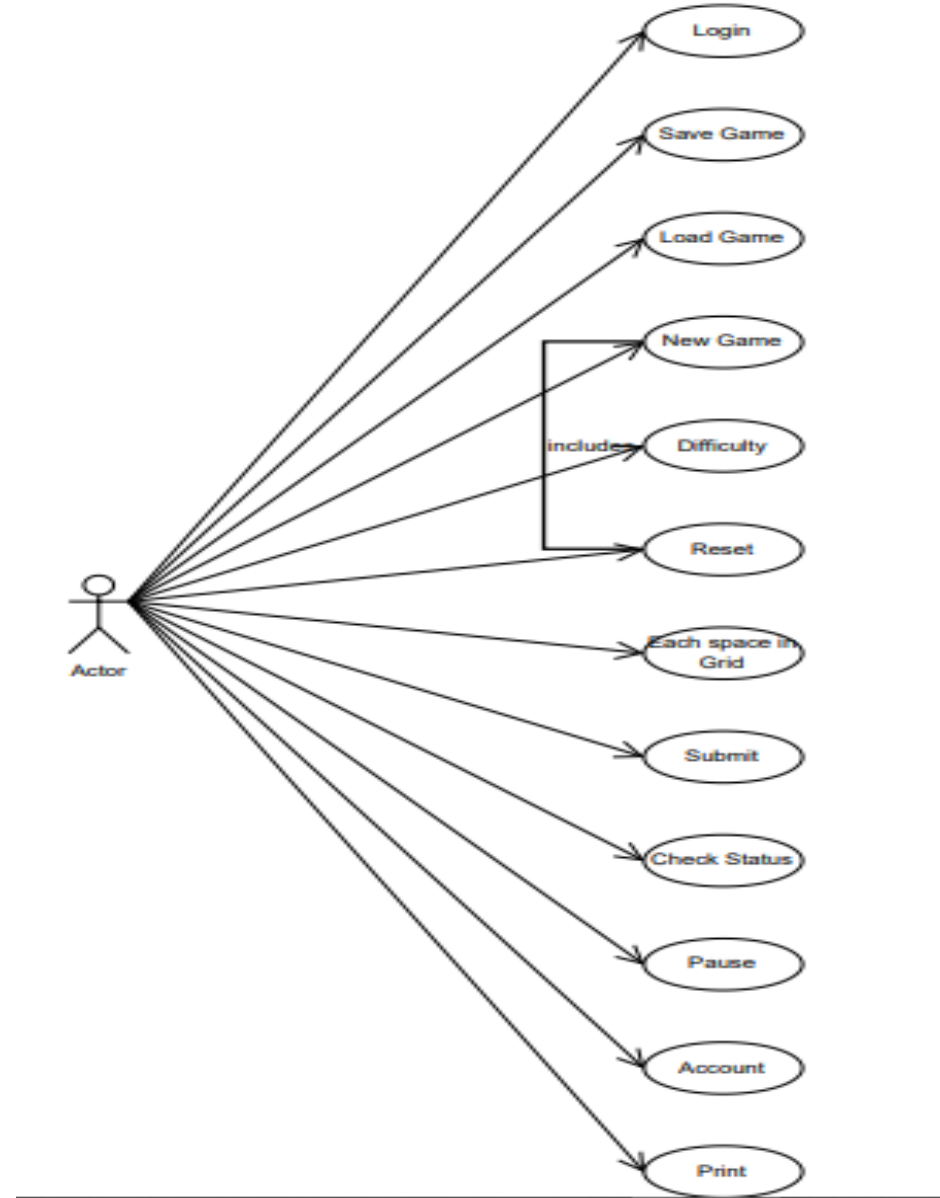
FLOWCHART



SEQUENCE DIAGRAM



USECASE DIAGRAM

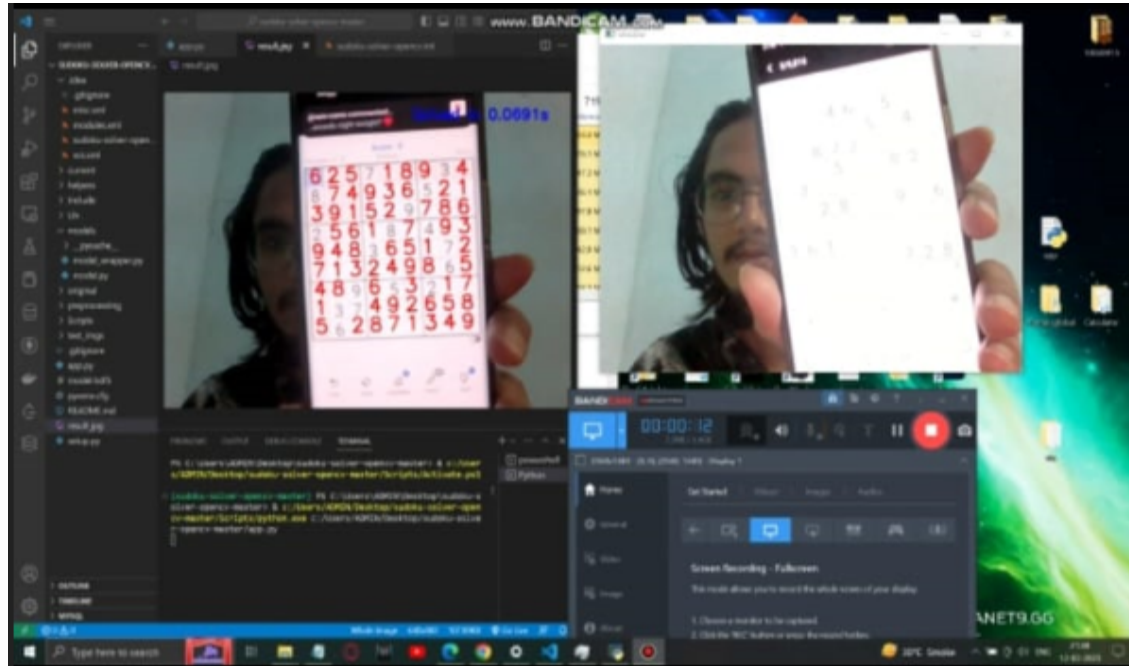


Implementation Details

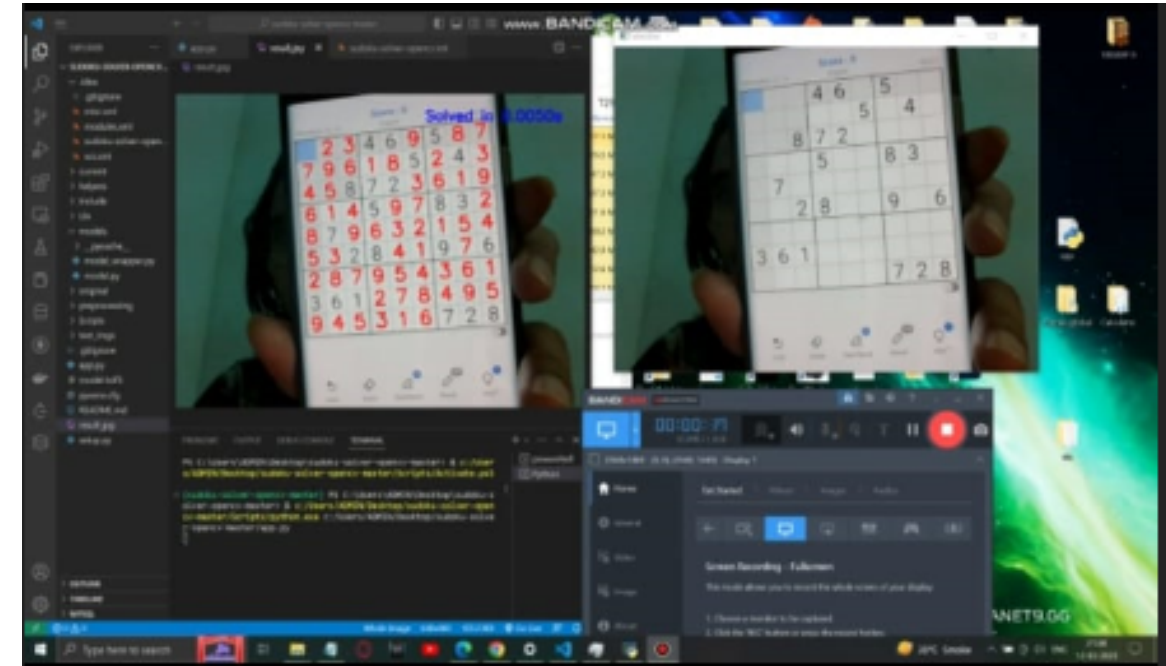
- Research and understand existing Sudoku-solving algorithms, AI techniques, and logical strategies.
- Design and develop an AI algorithm that can efficiently solve Sudoku puzzles using techniques such as constraint satisfaction, backtracking, and logical deductions.
- Test the IntelliSudoku system rigorously with a variety of Sudoku puzzles, evaluating its accuracy, speed, and user experience.
- Gather user feedback and iterate on the system to improve its performance, usability, and overall effectiveness.

Screen shots of implemented work

- BEFORE



AFTER



Conclusion

- IntelliSudoku, the AI-Powered Sudoku Solver, combines the power of artificial intelligence and an intuitive interface to provide an efficient and enjoyable Sudoku-solving experience.
- With its advanced algorithms and interactive features, IntelliSudoku aims to revolutionize how Sudoku puzzles are solved.
- Get ready to elevate your Sudoku-solving skills and experience the thrill of effortlessly conquering even the most challenging puzzles with IntelliSudoku!

Future Work

- Improved AI Algorithms: Enhance the AI algorithms used in IntelliSudoku to solve Sudoku puzzles. Explore advanced AI techniques such as machine learning and neural networks to improve the accuracy and speed of the solver. Continuously update and optimize the algorithms based on new research and developments in the field of AI.
- Solving Strategies and Techniques: Expand IntelliSudoku's capabilities by incorporating additional solving strategies and techniques. Include more advanced logical deductions and pattern recognition methods to further enhance the solving process. Provide explanations and tutorials on different solving techniques to educate users and improve their Sudoku-solving skills.

References

- <https://medium.com/swlh/how-to-solve-sudoku-using-artificial-intelligence-8d5d3841b872>
- <https://github.com/zackthoutt/sudoku-ai/blob/master/README.md>
- <https://www.activestate.com/blog/solving-sudoku-with-python-and-artificial-intelligence>
- <https://www.freecodecamp.org/news/solve-sudoku-using-azure-ai/>

Thank you!