Title: Sudoku Solver

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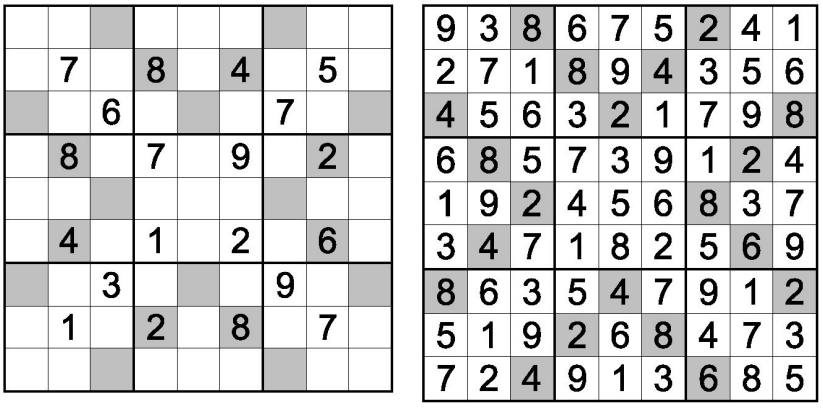
Summary:

This project can quickly identify Sudoku games in photos (or video screenshots) and automatically fill empty spaces. In our scenario, by using computer vision knowledge, we want to identify Sudoku photos that are not clear or having low resolutions or having bad lighting conditions or other non-Sudoku disturbances part.

Background:

Our idea comes from CHRIS(2009,07,19), How does it all work? *IPHONE SUDOKU GRAB.*from http://sudokugrab.blogspot.com/2009/07/how-does-it-all-work.html. This sudoku grab process only grabs normal shape of sudoku and solve it, what we are going to do in our project is trying to solve some different shapes of sudoku like Even Sudoku that places a digit from 1 to 9 into each of the empty squares so that each digit appears exactly once in each of the rows, columns and the nine outlined 3x3 regions. and there are some grey squares must contain even digits.



EVEN SUDOKU.

The solver will be developed on PC and the photos can be uploaded on PC from anywhere. We are looking for more shape and types of sudoku to be solved and those sudoku can be recognized from newspaper or coloured magazines.

The members of our group are good at sudoku games and they have confidence in developing a sudoku solver algorithms.

The Challenge:

We want to learn how to recognize shapes and numbers in images with this project. Identifying pictures with bad shooting conditions will be a challenge. In addition, interference items need to be excluded to ensure that Sudoku is correctly identified (not other squares in the same image). Another challenge is that we need to develop one or more sudoku solver algorithm that can solve different types of sudoku.The biggest challenge is how to correctly identify the numbers in the picture.

Goals and Deliverables:

There are three main goals in the project:
The first one is the software should correctly identify the sudoku squares and the number inside them in a lower resolution.
The second one is Identification Numbers. According to our study, We will first extract the picture with numbers and binarization the numbers on a picture, and extract every hierarchy of numbers, then we will use Knn(K-Nearest Neighbor) algorithm identify the numbers. We even have an idea to use human recognition to train computers to recognize numbers, just like Google's recognition robot program. After a lot of human identification, a digital library was created and machine learning was done.
The third one is that we need to develop an efficient algorithm to solve the puzzle.
There are extra goals we may want to achieve:
we are planning to develop more algorithm to solve the sudoku in different shapes, we noticed that there were many shapes of sudoku, so we might at least do one more algorithm for another shape.

The extra goals will only be considered or completed if we have extra time after we reach the main goals. Unfortunately, our team members chose to withdraw this course, coupled with the outbreak of the covid-19, we do not have enough time and energy to complete more parts.

How to Test:

A sudoku is a square with numbers from 1 to 9 so that for each row and column, each number only appears once. So it is easy to test if the software is working: just check if there is a number appears twice or more in the same row or column.

Our software will take a picture and recognize if there is a sudoku on it and then identify the numbers on it, solving the sudoku is the last step. So before checking if the sudoku is solved, the user should check if there is a sudoku square on the picture, then check if the numbers on the sudoku solver is the same ones as the ones on the picture.

realistic:

The sudoku solver is not that difficult to develop, but it still has some challenges, so we will do our best to reach those extra goals before the deadline. Our team will check the schedule every week to make sure we have enough time to reach our main goal and get quickly work in extra goals.

Schedule:

Feb 1st Create outline and start to think what team need.
Feb 8th do the research that how to recognized photo
Feb 15th develop a process that can take out the shape from photo in high resolution.
Feb 22th develop a process that can take out the numbers from photo in high resolution.
Feb 29th update the process that can be recognized as low resolution and take them out to process.
Mar 7th try to write the algorithm to solve normal sudoku
Mar 14th combining the photo recognized and sudoku solver algorithm as demo.
Mar 21th bug test and fixed if there is, also beginning solve extra goal
Mar 28th solve one or two different shape or types of sudoku as extra goal
Apr 4th try make UI clearly and easy to use and test repeat.
Apr 10th Test repeat to make sure the slover run smoothly and upload to culearn.