Tic Tac Toe – Down The Memory Lane 02

Hello guys welcome to the programming screen cast of tic tac toe, we had some discussion about the game which we played in our childhood namely the tic tac toe. It has the three cross three board that is nothing but the board consisting of three rows and three columns that is the nine cells, so according to us that is three rows that is row one row two row three, column one column two column three that is how we count but computers count in a different way, let me show you see this is how the index is done in a computer for a board sort of structure this is nothing but matrix basically this is a matrix for a computer that is 2d array that is the two dimensions, there are two dimensions namely the rows and the columns so it's the 2d array this is how the computers represent the board has that is how they interpret the board as see the counting starts from zero, zero one two that is how it counts we count as one two three so please note that if we say second row second column then it is first row first column for the computers so that is whatever is our count you subtract one from it then you will get the count as per the computer perspective this is how we have to we have to take care of the perspectives of humans and computers, first i would like to tell you this regarding the indexing part ok now let's get started with the game, basically let me just give you a brief overview here let me give you see this is three cross three board that is the board containing three rows and three columns so players there are two players in this game each players is given a symbol one is given a symbol X one is given a symbol O, they have to initially the board is fully empty we have to place their symbols in one of this vacant positions in the board, this is how the game goes suppose player one places here next time player two cannot occupy the same position he has to occupy the vacant position something like that the game goes and if you would see the players who occupies consecutive three cells along any of the rows or any of these columns or along this diagonals or this diagonal is consider to be the winner. That is the player who is able to first occupy three consecutive cells in this manner is the winner, in case no one is able to do then it is a draw so here as i had discussed in the lecture the game is not just about your moves, it is about your ability to predict how your opponent will play so every player will play keeping in mind that he has to maximise his chances of winning and minimise the chances of opponents winning for example let me just give you overview it is better if you could have a pen and paper draw a board because for indexing purposes i have taken this particular image, but plane board be a beneficial but no problem you please take a paper and draw this kind of grid and follow my instructions and based on that you can understand so this is basically an empty board initially so the first player comes places his symbol here, why this place? Because along this diagonal or rows or columns any way at least one of this ways he has to occupy three consecutive positions only then he can win maximise his chances of winning this particular position one comma one for the computer and second row second column for humans this particular position is intersection of many of the winning possibilities, along this diagonal along this diagonal row this column along four of the winning possibilities there are three columns three rows two diagonals among eight winning possibilities on four of the wining possibilities, this particular cell is present so smart player would start playing this position to maximise his chances of

winning. So this will be the first players move so the second player when he gets the move in the next turn he would want to maximise his chances of winning also to block him from the winning that is to minimise his chances he wants to block him from winning so here if you have a X so he would like to block one of the four wining possibilities for him so maybe he can place his coin somewhere here so that this row possibility has been block now given that this row possibility has been block in the next turn if the player X places his coin here it is a waste so he would place his coin somewhere here so now if you have seen till now here you have X here you have O here you have X so if somehow this is now O's turn if somehow in the next turn X could be placed here X would be the winner O thinks in that way if i miss this particular location next time X will place his coin here and he would be the winner so he would place his coin O here to block his winning opportunity i guess now you have understood what the strategy the players would be using they would want to maximise their chance of winning as well as they would like to minimise the chance of the opponent winning if both the players are smart this try dry running some any sequence of run if try dry running just think that both the players are equally smart it would be a draw. In case if at some point of time the player losses the foresightedness he doesn't think of his opponent in some point of time suppose assume that in this particular instance O doesn't place his coin here he places somewhere here the next turn when it for X, X would place his coin here than thinking of blocking O it is beneficial for him to place his coin and win, so your aim will be both, more priority to your winning at the same time not a minimum priority to defeating your opponent, you have to minimise his chance of winning, you have to block him as much as possible as well as increase your chances of occupying three consecutive cells so that you can win so this is how the game goes as i have recommended if you had taken a blank sheet of paper and dry run how the game would go just play the game without using a computer, just try you would understand how the game is played, what kind of smartness is required from the player for the game and so on so this is how the game goes so let us now start coding now ok so as i had said it is a 2d array the board is the 2d array for the computer so that arrays has been defined in a package called num py let me import it import numpy, i had import it so let me call it as board that is the name easier for me so let me call it as board i would say numpy numpy dot array, array of we need an array of three rows and three columns, we need to give it as a list and within the list each row as to be a separate list so you have blanks initially so for blanks i am representing it as hyphens that it is a blank cell that is what i mean by hyphens here so i have three columns in each row so three hyphens i would be giving so all these three or blanks sorry for this first row has been given now the second row so let me give ok second row is over now the third row ok first column of the third row, second column of the third row then third column of the third row so all three rows has been defined ok now for player one the symbol i allocate is X i had told it is X for player two i allocate the symbol O so that is what i had defined here player one symbol player one symbol for symbol i am using X player one symbol is X player two symbol is O so now let me start the game let me say play. As we would have seen till now just saying play serve the purpose because it is something we are defining see you got a morning symbol it is an undefined name so we have to give the proper definition as to what as to be done when you say play so let me define it define play ok give colon here so here start the function definition. So every particular turn, turn has to be alternated the first turn if it is given for X second turn must be given for O so how many turns

would be given totally? It is three cross three grid that is there are nine cells so there will be nine turns so let me say for i will use a for loop because i need to repeat it nine times turn i use intuitive name so that it is easier to understand turn in the range you would have seen this syntax till now this is how you use for loop for a pre defined number of times, i wanted nine times so let me say nine for turn till the range of nine what you do is, it start from zero till eight it will count so zero two four six all these turns should correspond to player X that then one three five seven that is even turns is for player x and odd turns is for player O so how do we capture this? Using the modulo operator let's do that. So i will use if turn modulo two is equal to zero that is if it is an even turn you should say it is the turn of X let me print X turn so this is turn of X ok so you should allow him to place his symbol on the board so let me call place player one symbol and then after he places his symbol initial two moves if you would have observed the winning possibility from the fifth move only but still this single loop will be running for all the turns so let us include this check here but it will not be used in the initial stages but in the subsequent stages it would be needed that is as soon as there is a winning move, that is if there is some vacant slot still not that is all nine slots have not been occupied but still there is there was a winning move then the game has to stop so for that let me say you have to if won let me use terminology like this if one if someone this player one symbol this person has won then break that is you should quit the game this is nothing but we are quitting the game else so this is for player X we had done else that is the turn is odd turn so all these things we would copy we would do this for player two whose symbol is O so i had used O player two symbol and if player two symbol this particular thing has won we have to check that is why do we check this? As you would have seen in this dry run during the fifth turn there is a possibility that one player can win that is from fifth turn any turn anyone can win there are good amount of possibilities that there can be a winning move so if that particular move if he has placed it in some position and if that placement is a winning placement then you should quit the game that is why we are using this so far so good this are intuitiveness so i guess you can understand it that is you have to repeat this things nine times that is because of the nine cells present in the board, if for every even number turn this is for X and odd numbered is for O allow the player to place his symbol into the into a vacant slot in the board check if that is a winning placement quit this is what we have done till now. Ok as you could see here, see these are undefined names place and won so let me defined that here now ok define place so we have used p one s p two s let me say symbol it is a common terminology player one symbol player two symbol whatever this is be the it is a symbol so i had said that ok so first what should i do? Print the board so since it is a matrix that is i have to display it in the rows and columns format for that we have a predefined functionality to convert it into this is in the list format we need to convert it into rows and columns format for this we have a predefined functionality let us use it numpy dot matrix there is a functionality here numpy dot matrix within in that you have to pass the name of the variable here it is board that is it will take the value of the board in list format convert it into the row and column format and print it that is a purpose of this functionality ok we will print the board then we have to say we have to get the input for in which particular row that is how does it, what does it signify if i is, you are saying that you should allow him to place his coin where would he place? In some particular cell that is identified by the row number and the column number so row get the value input from the user row is an integer so let me type cast it

initially its easier now ok, row i should get an input this is actually dependency on Mac system that's it in Linux systems as much as i have used this particular type casting thing is needed these are all some trivial things depends on your operating systems in case you are using some other systems and there is some other requirement you can always google it and get back the correct method as per your system this i am doing it with respect to the Mac system ok so i had type casted i am taking the input so i should say enter your rowth position enter row what are the values for rows that is allowed? One or two or three these are the allowed rows ok that is as per the humans perspective i told you counting that starts from zero why why is it that we are giving one two three here because this is as per the human perspective you are familiar with computers so you can understand this indexing mechanism but where as if you would ask this must be designed so that anyone can play the game so for human perspective the counting starts from one that's why we are giving like this then adjust it in the upcoming steps so you get the input and copy paste ok column so i should say enter column column one or two or three so i had said that this is the value you have to input it but what if the person has inputted a row and column that is already occupied or what if by some type of mistake or something he has inputted a value that is out of range of the board we have to handle it, all these we are doing it to ensure that your programme is robots and fault tolerance that is whatever be the fault that may be occurring due to the users input it must be handle your programme, your programme must be able to handle it we should not say that it is your mistake we should be able to handle it as much as possible that is one of the principle in software engineering that you have to make your systems friendly and fault tolerant that is if user commit some mistake even your software may be able to handle it you must be able to display him some polite nice message that this is the reason why this cannot be accepted please try again with the valid thing something like that, that is courteously that is the practice followed generally so let us do that here so let me check if so if it is a valid input i have to say ok you can place it, how would i do that? In case if it is an invalid input i should repeat the process so i need to i need to use while loop here so let me use it while one because it has to turn infinitely till you get the correct input so correct input so if it is a correct input i have to break so what is the correct input? Row the value of row is greater than zero, one or two or three all are greater than zero right? and the value of row is less than four, one two three all are less than four and even column must be same like this column should be greater than zero and column is less than four and that must be a vacant column for vacant what are we using it? We are using a hyphen so i am going to check that one, board of should we use row column? Or row minus one column minus one? it is row minus one and column minus one, why do we use it? As i had shown you the indexing earlier computers start counting from zero where as humans start counting from one this we have taken the input in a human friendly manner but we have to convert it into a computer friendly manner that is why we are deducting one as i had shown you that time second row and second column of humans is nothing but one comma one for computers so you have to subtract from both the indices row as well as column this is how the computers works so if the humans says second row first column it is nothing but two minus one first row and one minus one zero, first row zeroth column for the computer so this is how the computer will inter crypt because why is this different? Because humans start counting from one, computers start counting from zero that is the reason so if this particular thing is blank, blank is given by hyphen, if all these

conditions are satisfied that is row and column are within this range one or two or three so it is greater than zero or less than four is nothing but one two or three and column is also the same and if the deserve vacant position then it is a valid input you can break here that is you can let him play yes broken from the loop so corresponding to this here you should let him place board of row minus one and column minus one is nothing but the symbol, whatever the symbol he wants to place this is how the place functionality works please check once again. It is you are displaying the board asking them for input to enter row and column value in case if they enter a faulty input or if that is not a vacant position you will repeat asking for inputs till they enter and if you again and again ask inputs they will get irritated so you should say if this particular this is for checking that whether the input is a valid input, if it is not a valid input you should print saying that invalid input invalid input please enter again some polite message only then they will understand that ok we had made a mistake and that is why you are asking the input again and again otherwise they may think that there is some fault in the system that's why even though i gave an input it is asking again that is what people will think that is why we have to print a message in a way that they can understand easily this is important please note this, this is important so we will ask input as long as it is not valid once it is valid we break from this loop and place that particular players symbol here so see place players one symbol in even number turn player two symbol in odd number turn so whatever is the symbol being pass here that would be placed in that position so this is how it happens so place has been done so please see to the flow till now may be you can pause here for some time and then you can see it and yeah see we had missed one more thing, if player one has won we should say break, player two has won you should say break if no one has won at the end of nine turns that the all the cells have been occupied and still no one has won we should see we should tell that, that has to be included so let us include it if you should say if that is not won if that person has not won player one has not won see not is an operator that is predefined that is one will say if the person has won or not that is it is true or false? If it says true if you are applying not it would become false so it will invert the output of this particular thing, it will invert whatever is the truthfulness into it, that is what not does ok and not player two is also not won, not won of player two symbol if both haven't won then you should print it is a draw ok so why did we do that? Because draw is also possible so that is why we had done this, this ok indentation is important it has to be at this particular position only column five because at the end of all turns only you have to check that is all nine cells have been occupied and still no one has won that means it is a draw, so we are checking it here fine let me change the indentation here too ok so this and this will be in the same level yeah nine and column nine fine ok please pass till here understand the flow of the programme and in the next video we will see how this functionality won, which has whether the person has won or not can be realised.