HW-3

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Fundamentals of Artificial Intelligence

Q1)

Figure which was given to us was

1	2	3
4		
5		

The words given are

add, age, aim, aid, air, are arm, art, bad, bat bee, boa dim, ear, eel, eft, lee, oaf.

What we need to do is we need to fit 6 words that satisfy the method constraints.

→ We can solve it using trial and error method.

a	d	d

As we can see we dont have 2 words that starts with dd. So ~~elim~~ So we will not consider it.

→ We can choose bee as the last 2 letters are 'e'. and we have words that start with it.

1 down should be a word that starts with b.

b	2 e	3 e
4		
5		

We need to pick 2 words that starts with 'e'

· We can choose 'eft' and 'ear'

Now the puzzle look like this:

b	e	e
	a	b
	r	t

If we write boa. Then we can finish the puzzle.

b	e	e
o	a	b
a	r	t

Words given are:
add, age, aid, aim, air, are, arm, art, bad, bat, bee, boa dim ear, eft, lee, oaf

a) Pruning due to domain consistancy using first representation
→ An illustration of pruning for domain consistancy using the first representation. We need to consider the crosswords 1-across and 1-down spots. The initial letter of the 1-down position must be an "a". If we put "add" to the 1-across position.
→ Only "add" and "age" are found within the list of potential words that begin with the letter "a". Due to the domain consistancy, the domain of the 1-down position is reduced to "add" and "age". {add, age} There are no constraints.

b) Arc consistancy pruning example using the first representation:
→ First, we assume that placed 'age' in the 1-down position and "add" in the 1-across position. Now, we will consider 2-down and 4-across positions. Since, "g" is the second letter in the 1-down position, "g" must also be the first letter; and there are no words with g.
→ Due to arc consistancy, this inconsistancy does not work.

c) → Arc consistancy and domain consistancy together are not adequate to do this problem using first representation.

→ They can't guarantee a solution, but they can aid in reducing the search area and pruning the variable domains. To solve a crossword puzzle, additional methods of search such as backtracking, could be necessary in some circumstances.

→ Now we will look at the illustration of how this issue can be resolved with backtracking algorithm.

(i) We will start with no additions to any variables.

(ii) We will select the variable and make sure to verify whether the assignment breaks any rules.

(iii) We can use an alternative approach for the value of the variable and go back to the previous step.

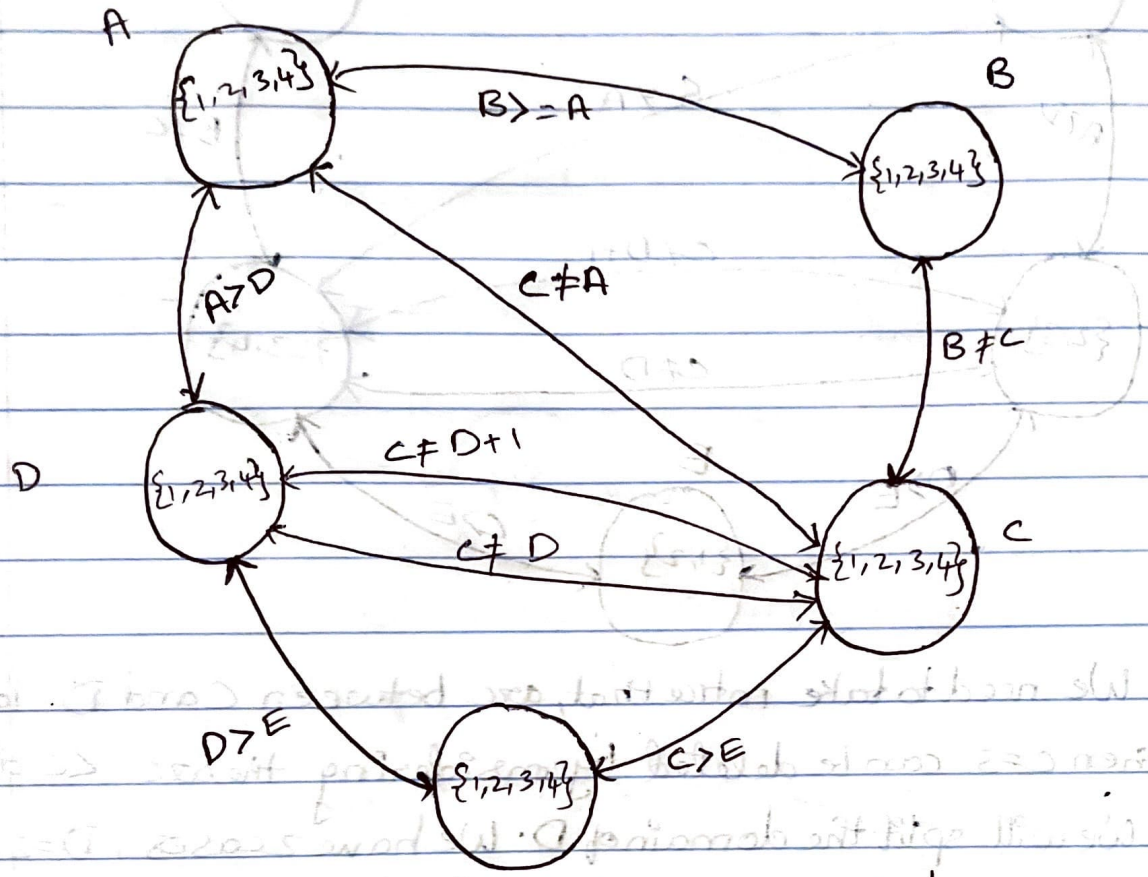
(iv) Recursively apply values to other variables in the issue if the assignment does not contravene any restrictions.

(v) If there is a solutions to the issue exists, the backtracking method can ensure it will locate it.

However, be computationally expensive, particularly for big issues.

Q2)

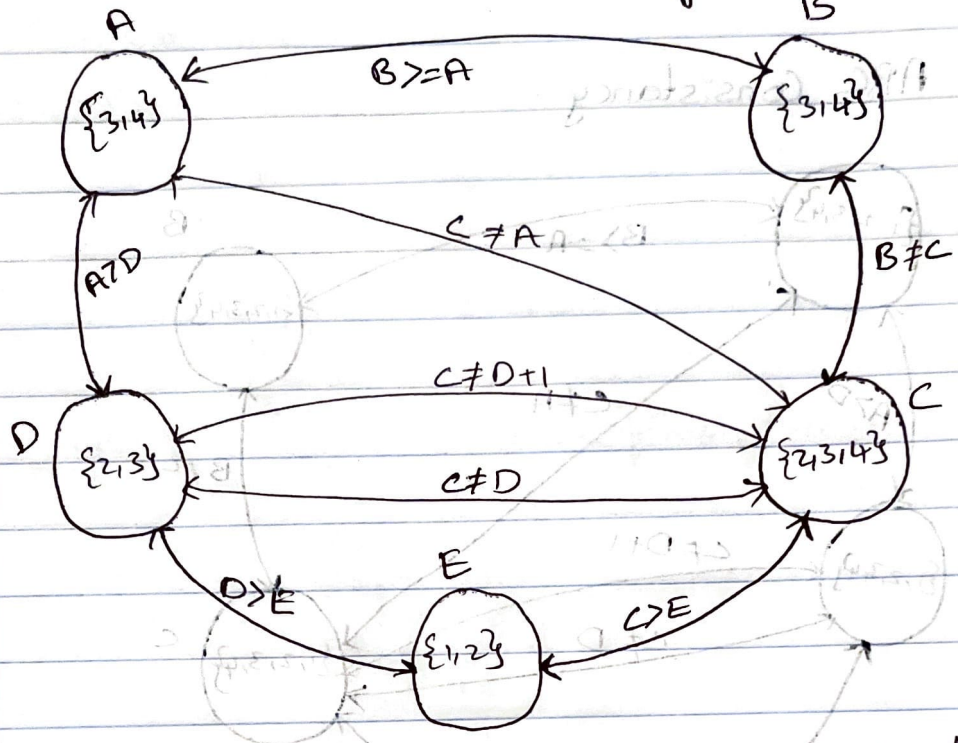
(b) ARC Consistancy.



The domain items E that are removed at each phase are listed below along with arc that is incharge

Arc	Relation	Deleted value
<D, E>	D > E	D = 1
<C, E>	C > E	C = 1
<E, D>	D > E	E = 4
<D, A>	A > D	D = 4
<A, D>	A > D	A = 1 and 2
<B, A>	B ≥ A	B = 1 and 2
<E, D>	D > E	E = 3

There is a stop to arc consistancy.



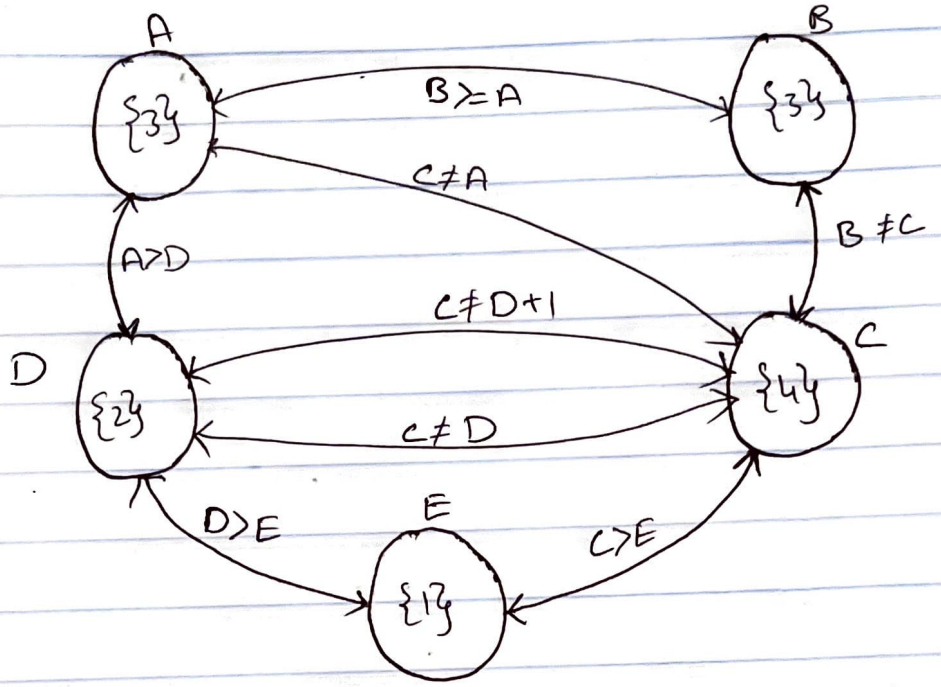
→ We need to take notice that, arc between C and D labelled then C=3 can be deleted by considering the arc <C,d>

→ We will split the domain of D. We have 2 cases, D=2 and 3.

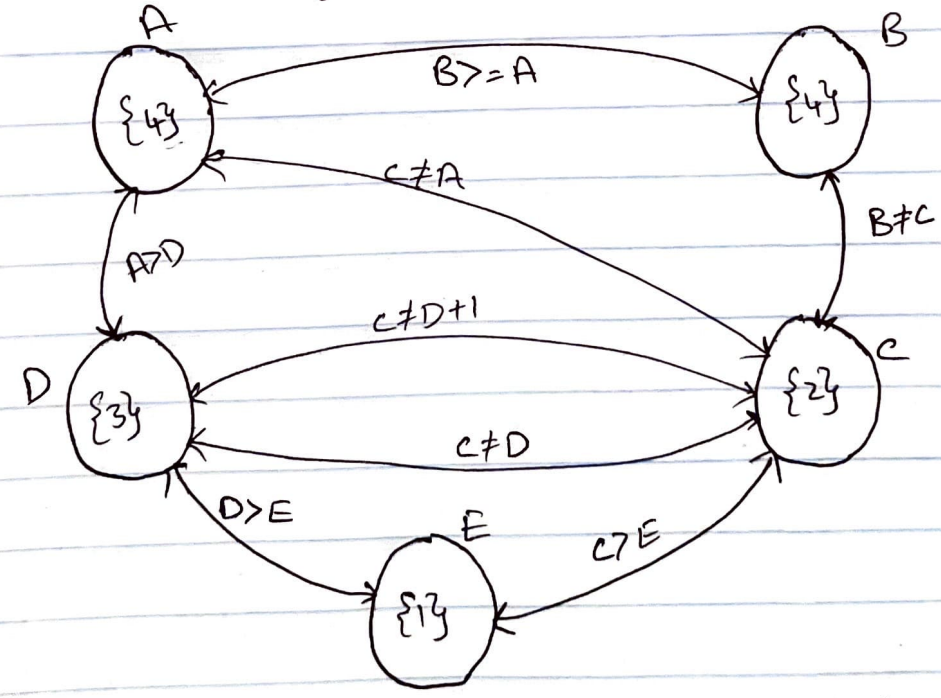
CASE-1: putting D=2 and running consistancy again

Arc	Values of Relation	Removed
<E, D>	D>E	E=2
<C, D>	C|=D	C=2
<C, D>	C|=D+1	C=3
<A, C>	C|=A	A=4
<B, C>	B|=C	B=4

The result will be.



CASE-2: We will now choose D=3 in the constraint and run arc consistancy.



These 2 constraints are the solutions.