COEP TECHNOLOGICAL UNIVERSITY, PUNE

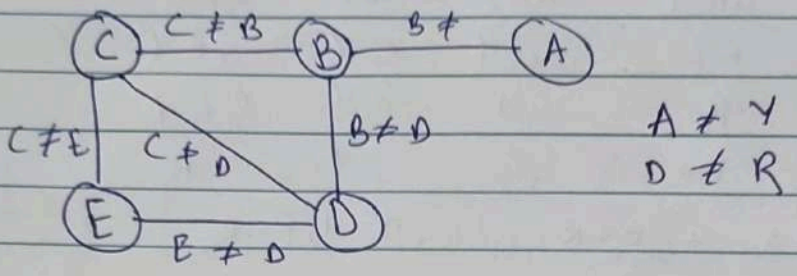
Wellesley Road, Shivajinagar, Pune-411 005

Ameya Kulkarni
MIS: 112103075
TY Comp Div 1

Assignment - 4

Constraint Satisfaction Problems

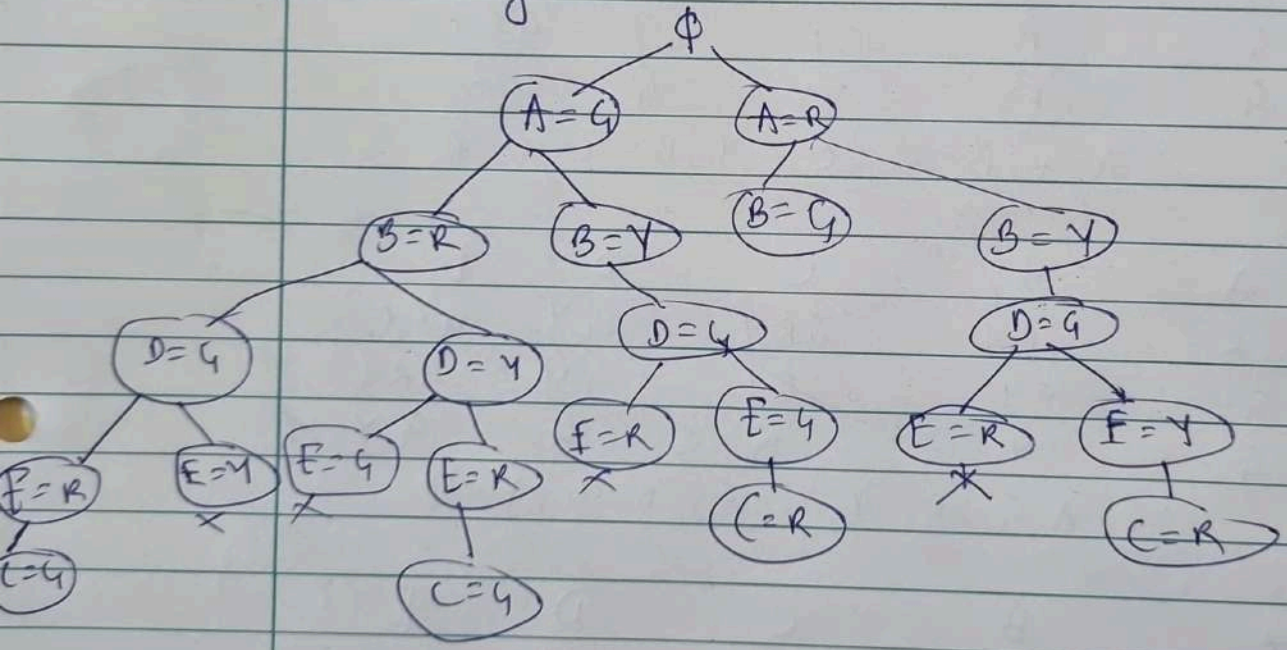
1.



$A \neq Y$
$D \neq R$

Variable = {A, B, C, D, E}
Domain = {G, R, Y}

i) Backtracking



Possible Assignments

1. A = G, B = R, D = G, E = R, C = Y
2. A = G, B = R, D = Y, E = R, C = G
3. A = G, B = Y, D = G, E = Y, C = R
4. A = R, B = G, D = Y, E = G, C = R
5. A = R, B = Y, D = G, E = Y, C = R

2. Filtering with MUR ordering

a.

A	B	C	D	E
GR	GRY	GRY	GY	GRY
G	RY	GRY	GY	GRY
G	R	GY	GY	GRY
G	R	G	Y	R

∴ A=G, B=R, C=C, D=Y, E=R

b.

A	B	C	D	E
GR	GRY	GRY	GY	GRY
G	RY	GRY	GY	GRY
G	R	GY	GY	GRY
G	R	Y	G	R

∴ A=G, B=R, C=Y, D=G, E=R

c.

A	B	C	D	E
GR	GRY	GRY	GY	GRY
G	RY	GRY	GY	GRY
G	Y	R	G	GY

∴ A=G, B=Y, C=R, D=G, E=Y

d.

A	B	C	D	E
GR	GRY	GRY	GY	GRY
R	GY	GRY	GY	GRY
R	G	R	Y	G

∴ A=R, B=G, C=R, D=Y, E=G

e.)

A	B	C	D	E
GR	GRY	GRY	GY	GRY
R	GY	GRY	GY	GRY
R	Y	R	G	Y

$\therefore A = R,\ B = Y,\ C = R,\ D = G,\ E = Y$

3. AC - 3

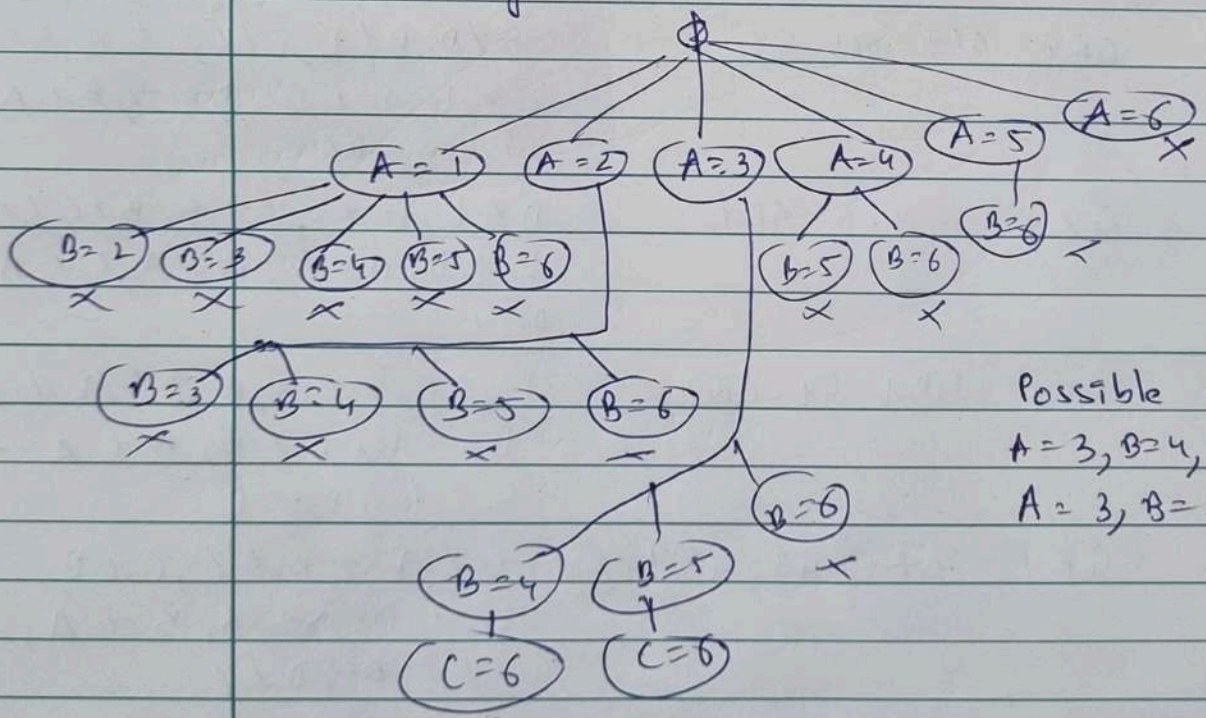
Remove	A	B	C	D	E	Add	Queue
	GR	GRY	GRY	GY	GRY		$A \neq B, B \neq D, D \neq E, E \neq C, C \neq B, B \neq C, C \neq E, E \neq D, D \neq B, B \neq A, C \neq D, D \neq C$
$A \neq B$	GR	GRY	GRY	GRY	GY		$B \neq D, D \neq E, E \neq C, C \neq B, B \neq C, C \neq E, E \neq D, D \neq B, B \neq A, C \neq D, D \neq C$
$B \neq D$	GR	GRY	GRY	GY	GRY		$D \neq E, E \neq C, C \neq B, B \neq C, C \neq E, E \neq D, D \neq B, B \neq A, C \neq D, D \neq C$
$D \neq E$	GR	GRY	GRY	GY	GRY		$E \neq C, E \neq B, B \neq C, C \neq E, E \neq D, D \neq B, B \neq A, C \neq D, D \neq E$
$E \neq C$	GR	GRY	GRY	GY	GRY		$C \neq E, B \neq C, C \neq E, E \neq D, D \neq B, B \neq A, C \neq D, D \neq C$
$C \neq B$	GR	GRY	GRY	GY	GRY		$B \neq C, C \neq E, E \neq D, D \neq B, B \neq A$ $C \neq B, B \neq A,$ $C \neq D, D \neq C$

Possible Assignments

1. A = 4, B = R, D = 4, E = R, C = Y
2. A = 4, B = R, D = Y, E = R, C = 4
3. A = 4, B = Y, D = 4, E = Y, C = R
4. A = R, B = 4, D = Y, E = 4, C = R
5. A = R, B = Y, D = 4, E = Y, C = R

2. Variable = {A, B, C}
   Domain = {1, 2, 3, 4, 5, 6}
   Constraints = {A < B, B < C, A + C = 9}

1. Backtracking



Possible Assignments
A = 3, B = 4, C = 6
A = 3, B = 5, C = 6

2. Filtering with MVR ordering

a)

A	B	C
123456	123456	123456
1	23456	ϕ

b)

A	B	C
123456	123456	123456
2	3456	ϕ

c) A B C
123456 123456 123456
3 56 6
3 4 6
∴ A = 3, B = 4, C = 6

d) A B C
123456 123456 123456
3 456 6
3 5 6
∴ A = 3, B = 5, C = 6

e) A B C
123456 123456 123456
4 56 ϕ

f) A B C
123456 123456 123456
5 6 ϕ

g) A B C
123456 123456 123456
6 ϕ ϕ

3) AC - 3

Remove	A	B	C	Add	Queue
	123456	123456	123456		A≠B, B≠C, A≠C=9 C≠A=9, C>B, B>A
A<B	123456	123456	123456	C+A=9	B<C, A≠C=9, C≠A=9, C>B, B>A, C≠A=9
B<C	12345	12345	123456	A<B	A≠C=9, C≠A=9, C>B B>A, C≠A=9, A<B
A+C=9	345	12345	123456	B>A	C≠A=9, C>B, B<9 C≠A=9, A<B, B>A

C>B	345	12345	456		B>A, C+A=9, A<B, B>A, B<C
B>A	345	45	456	C>B	C+A=9, A<B, B>A, B<C, C>B
C+A=9	345	45	456		A<B, B>A, B<C, C>B

∴ Possible Assignments

A=3, B=4, C=6

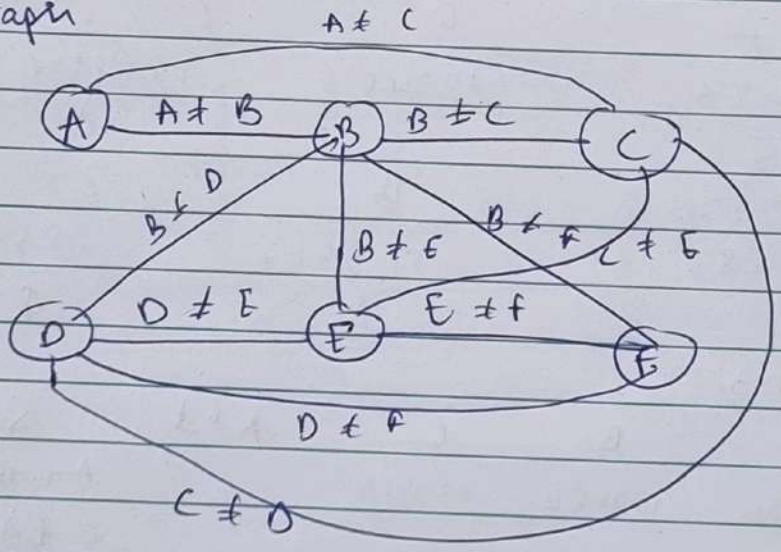
A=3, B=4, C=6

3. 1. Variable = { Estonia: A, Russia: B, Latvia: C, Lithuania: D, Belarus: E, Poland: F }

Domain = {Red, Blue, Green}

Constraint = { A≠B, A≠C, B≠C, B≠E, B≠D, B≠F, C≠E, C≠D, D≠E, D≠F, E≠F }

2. Graph



3. Filtering with MCR

A	B & C	D	E	F
RGB	RGB	RGB	RGB	RGB
R	GB	GB	RGB	RGB
R	G	GB	R	G

Considering Kaliningard as a city no any is possible