



MEDICAL APPOINTMENT

Test case and
logic analysis



A row of white chess pawns is arranged in a line, receding into the background. In the center foreground, a single red pawn stands out. The background is a soft, out-of-focus light blue.

Example 1 - The human approach

Simple rescheduling
Maximizing personal benefit

Initial state

Timeslots

Monday	Patient - Score
9-10	Nikos – 90
	Giorgos – 87
	Kostas – 86
Tuesday	Patient - Score
13-14	Giorgos - 72
	Ioannis - 60
	Maria - 55
Thursday	Patient - Score
11-12	Ioannis - 45
	Maria - 40
Friday	Patient - Score
15-16	Kostas - 71
	Despoina - 70

Appointment Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
9-10	Nikos				
10-11					
11-12				Ioannis	
12-13					
13-14		Giorgos			
14-15					
15-16					Kostas
16-17					

$$\text{Common Benefit} = 90 + 72 + 45 + 71 = 278$$

Nikos cancels his appointment

Timeslots

Monday	Patient - Score
9-10	Nikos - 90
	Giorgos - 87
	Kostas - 86
Tuesday	Patient - Score
13-14	Giorgos - 72
	Ioannis - 60
	Maria - 55
Thursday	Patient - Score
11-12	Ioannis - 45
	Maria - 40
Friday	Patient - Score
15-16	Kostas - 71
	Despoina - 70

Appointment Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
9-10	Nikos				
10-11					
11-12				Ioannis	
12-13					
13-14		Giorgos			
14-15					
15-16					Kostas
16-17					

Common Benefit = ?

New timeslots become available for Giorgos and Ioannis

Timeslots

Monday	Patient - Score
9-10	Giorgos – 87
	Kostas – 86
Tuesday	Patient - Score
13-14	Ioannis - 60
	Maria - 55
Thursday	Patient - Score
11-12	Ioannis - 45
	Maria - 40
Friday	Patient - Score
15-16	Kostas - 71
	Despoina - 70

Appointment Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
9-10	Giorgos				
10-11					
11-12				?	
12-13					
13-14		Ioannis			
14-15					
15-16					Kostas
16-17					

Common Benefit = ?

Now Maria can receive an appointment

Timeslots

Monday	Patient - Score
9-10	Giorgos – 87
	Kostas – 86
Tuesday	Patient - Score
13-14	Ioannis - 60
	Maria - 55
Thursday	Patient - Score
11-12	Maria - 40
Friday	Patient - Score
15-16	Kostas - 71
	Despoina - 70

Appointment Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
9-10	Giorgos				
10-11					
11-12				Maria	
12-13					
13-14		Ioannis			
14-15					
15-16					Kostas
16-17					

$$\text{Common Benefit} = 87 + 60 + 40 + 71 = 258$$

A row of white chess pawns is arranged in a line, receding into the background. In the center foreground, a single red pawn stands out. The background is a soft, out-of-focus light blue.

Example 2 - The AI approach

Rescheduling with foresight
Maximizing common benefit

The same initial state

Timeslots

Monday	Patient - Score
9-10	Nikos – 90
	Giorgos – 87
	Kostas – 86
Tuesday	Patient - Score
13-14	Giorgos - 72
	Ioannis - 60
	Maria - 55
Thursday	Patient - Score
11-12	Ioannis - 45
	Maria - 40
Friday	Patient - Score
15-16	Kostas - 71
	Despoina - 70

Appointment Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
9-10	Nikos				
10-11					
11-12				Ioannis	
12-13					
13-14		Giorgos			
14-15					
15-16					Kostas
16-17					

$$\text{Common Benefit} = 90 + 70 + 45 + 75 = 280$$

Again, Nikos cancels his appointment but ...

Timeslots

Monday	Patient - Score
9-10	Nikos - 90
	Giorgos - 87
	Kostas - 86
Tuesday	Patient - Score
13-14	Giorgos - 72
	Ioannis - 60
	Maria - 55
Thursday	Patient - Score
11-12	Ioannis - 45
	Maria - 40
Friday	Patient - Score
11-12	Kostas - 71
	Despoina - 70

Appointment Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
9-10	Nikos				
10-11					
11-12				Ioannis	
12-13					
13-14		Giorgos			
14-15					
15-16					Kostas
16-17					

Common Benefit = ?

This time the system chooses Kostas

Timeslots

Monday	Patient - Score
9-10	Kostas – 86
	Giorgos – 87
Tuesday	Patient - Score
13-14	Giorgos - 72
	Ioannis - 60
	Maria - 55
Thursday	Patient - Score
11-12	Ioannis - 45
	Maria - 40
Friday	Patient - Score
15-16	Kostas - 71
	Despoina - 70

Appointment Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
9-10	Kostas				
10-11					
11-12				Ioannis	
12-13					
13-14		Giorgos			
14-15					
15-16					?
16-17					

Common Benefit = ?

And a greater common benefit is produced

Timeslots		Appointment Schedule					
Monday	Patient - Score		Monday	Tuesday	Wednesday	Thursday	Friday
9-10	Kostas – 86	9-10	Kostas				
	Giorgos – 87	10-11					
Tuesday	Patient - Score	11-12				Ioannis	
13-14	Giorgos - 72	12-13					
	Ioannis - 60	13-14		Giorgos			
	Maria - 55	14-15					
Thursday	Patient - Score	15-16					Despoina
11-12	Ioannis - 45	16-17					
	Maria - 40						
Friday	Patient - Score						
15-16	Despoina - 70						

Common Benefit = 80 + 70 + 45 + 70 = 273 > 258



Notes (|)

- A chain reaction can only occur if a patient who has already received an appointment cancels the request for the appointment he or she has received. As a result, only in this case the clingo code for rescheduling will be executed.
- A chain can be realized only if every patient in it gives their consent. For that reason, the system will reach for the patient in every step of the chain to ask for permission to reschedule the appointment. A time limit for the patient's response must also be set.
- In case a patient in the chain denies the reschedule or their time limit exceeds the system should consider the request as deleted and execute the clingo code again.
- While the process of confirming a chain reaction takes place another cancelation might occur. The clingo code that will be executed must take into consideration the current state of the knowledge base to output the optimal chain reaction. All the ongoing chain reactions will be stored in the system. Once a reschedule is confirmed the patient will receive the timeslot and the confirmation process will continue to the next patient of the chain.



Notes (| |)

If a patient appears in multiple chains one of them must be chosen over the others and all the rest will break at the point where the patient appears. The designer must choose from the following four criteria when considering which chain will be chosen by the system:

1. The system chooses the chain in which the patient has the highest score, prioritizing the patient's preference.
2. The system chooses the chain in which the patient is closer to the top of the chain and thus more likely to receive a rescheduled appointment.
3. The system chooses the chain with the smaller common benefit from the patient in question until the end of the chain, thus minimizing the common benefit loss.
4. The system chooses the chain with the greater common benefit in anticipation of the chain's completion.