
Templates and Their Functions

1. RA & RV -- Random_Ventricle & Random_Atrium

- ✧ Purpose: These templates simulate the random generation of heartbeats in the ventricle (VPulse) and atrium (APulse). The RV function models the behavior of these pulses with respect to the minimum and maximum wait times.
- ✧ Variables:
 - ✓ x: A clock to keep track of time
- ✧ Parameters:
 - ✓ Vminwait, Vmaxwait: Define the minimum and maximum time between pulses.
- ✧ Broadcast Channels:
 - ✓ VPulse, APulse: Trigger events in the system when a pulse occurs.

2. AVI -- Con_AVI (Atrioventricular Interval)

- ✧ Purpose: This template manages the atrioventricular interval, which is the delay between an atrial pulse and the corresponding ventricular pulse.
- ✧ Variables:
 - ✓ PreviousExist: A flag to check previous conditions.
 - ✓ x: Clock to measure intervals.
- ✧ Broadcast Channels:
 - ✓ AVI_Start, AVI_Stop, PVARP_Start, PVARP_Ex, URI_Ex, URI_Stop, VP_Generate: Control the sequence of events and time intervals for pacing.

3. AVI_Timer -- Timer_AVI

- ✧ Purpose: This timer is responsible for monitoring the AVI (Atrioventricular Interval).
- ✧ Variables:

- ✓ x: Clock to track the time elapsed during the AVI.
 - ✧ Broadcast Channels:
 - ✓ AVI_Start, AVI_Stop, AVI_Ex: Manage the start, stop, and expiration of the AVI.
4. AVI Monitor -- Monitor_AVI
- ✧ Purpose: Observes and records the occurrence of atrial and ventricular pulses within the AVI.
 - ✧ Variables:
 - ✓ t: Timer to monitor pulse timings.
 - ✧ Broadcast Channels:
 - ✓ APulse, VPulse, AP, VP: Monitor pulses in relation to the AVI.
5. PVARP -- Con_PVARP (Post-Ventricular Atrial Refractory Period)
- ✧ Purpose: Manages the PVARP, a refractory period following a ventricular pulse during which atrial pulses are ignored.
 - ✧ Variables:
 - ✓ x: Clock for timing the PVARP.
 - ✧ Broadcast Channels:
 - ✓ PVARP_Start, PVARP_Ex: Control the PVARP timing.
6. PVARP_Timer -- Timer_PVARP
- ✧ Purpose: Times the PVARP duration.
 - ✧ Variables:
 - ✓ x: Tracks the time during PVARP.
 - ✧ Broadcast Channels:
 - ✓ PVARP_Start, PVARP_Ex: Start and stop signals for PVARP.
7. PVARP_Monitor -- Monitor_PVARP
- ✧ Purpose: Monitors the PVARP and observes any ventricular pulses during this

period.

✧ Variables:

- ✓ t: Timer to monitor the duration of the PVARP.

✧ Broadcast Channels:

- ✓ VPulse, VP, PVARP_Ex: Observe and log ventricular events during PVARP.

8. VRP -- Con_VRP (Ventricular Refractory Period)

✧ Purpose: Manages the VRP, a refractory period following a ventricular pulse, like PVARP but specific to the ventricle.

✧ Variables:

- ✓ x: Clock to time the VRP.

✧ Broadcast Channels:

- ✓ VRP_Start, VRP_Ex: Control the timing of VRP.

9. VRP_Timer -- Timer_VRP

✧ Purpose: Times the VRP duration.

✧ Variables:

- ✓ x: Tracks time during VRP.

✧ Broadcast Channels:

- ✓ VRP_Start, VRP_Ex: Manage VRP's start and stop times.

10. VRP_Monitor -- Monitor_VRP

✧ Purpose: Observes the ventricular pulses during the VRP period.

✧ Variables:

- ✓ t: Timer to monitor VRP.

✧ Broadcast Channels:

- ✓ VPulse, VP, VRP_Ex: Monitor events within VRP.

11. AEI -- Con_AEI (Atrial Escape Interval)

✧ Purpose: Controls the AEI, the interval at which the atrium is paced if no natural

atrial pulse occurs.

✧ Variables:

- ✓ x: Clock for AEI timing.

✧ Broadcast Channels:

- ✓ AEI_Start, AEI_Stop, AEI_Ex, AP_Generate, VP_Generate: Manage AEI's timing and interactions with other intervals.

12. AEI_Timer -- Timer_AEI

✧ Purpose: Times the AEI duration.

✧ Variables:

- ✓ x: Tracks time during AEI.

✧ Broadcast Channels:

- ✓ AEI_Start, AEI_Stop, AEI_Ex: Control AEI's start, stop, and expiration.

13. AEI_Monitor -- Monitor_AEI

✧ Purpose: Observes the occurrence of atrial pulses during AEI.

✧ Variables:

- ✓ t: Timer to monitor AEI.

✧ Broadcast Channels:

- ✓ APulse, VPulse, AP, VP: Monitor pulses during AEI.

14. URI -- Con_URI (Upper Rate Interval)

✧ Purpose: Manages the URI, which limits the upper rate of ventricular pacing.

✧ Variables:

- ✓ x: Clock to time the URI.

✧ Broadcast Channels:

- ✓ URI_Start, URI_Stop, URI_Ex: Manage URI's timing.

15. UPI_Timer -- Timer_URI

✧ Purpose: Times the URI duration.

✧ Variables:

- ✓ x: Tracks time during URI.

✧ Broadcast Channels:

- ✓ URI_Start, URI_Stop, URI_Ex: Control URI timing.

16. UPI_Monitor -- Monitor_URI

✧ Purpose: Observes ventricular pulses during URI.

✧ Variables:

- ✓ t: Timer to monitor URI.

✧ Broadcast Channels:

- ✓ VPulse, VP, URI_Ex: Monitor events within URI.

17. LPI -- Con_LRI (Lower Rate Interval)

✧ Purpose: Manages the LRI, ensuring a minimum heart rate by pacing the ventricle if no natural ventricular pulse occurs.

✧ Variables:

- ✓ x: Clock to time the LRI.

✧ Broadcast Channels:

- ✓ LRI_Start, LRI_Stop, LRI_Ex, VP_Generate: Manage LRI's timing.

18. LPI_Timer -- Timer_LRI

✧ Purpose: Times the LRI duration.

✧ Variables:

- ✓ x: Tracks time during LRI.

✧ Broadcast Channels:

- ✓ LRI_Start, LRI_Stop, LRI_Ex: Control LRI's timing.

19. LPI_Monitor -- Monitor_LRI

✧ Purpose: Observes ventricular pulses during LRI.

✧ Variables:

- ✓ t: Timer to monitor LRI.

- ✧ Broadcast Channels:

- ✓ VPulse, VP, LRI_Ex: Monitor events within LRI.

20. PaceMaker -- Pace_Maker

- ✧ Purpose: Central controller that generates pacing signals based on the inputs from various intervals and monitors.

- ✧ Broadcast Channels:

- ✓ AP, VP, AP_Generate, VP_Generate: Control pacing based on conditions from other templates.

Global Constants and Their Roles

- ✧ Timing Constants:

- ✓ TAEI = 800, TAVI = 150, TVRP = 150, TPVARP = 100, TURI = 400, TLRI = TAEI + TAVI: Define the specific durations for various intervals in milliseconds.

- ✧ Wait Time Constants:

- ✓ Vmaxwait, Vminwait, Amaxwait, Aminwait: Define the maximum and minimum wait times for ventricular and atrial pulses.

Global Flag

- ✧ PreviousExist: Tracks whether a previous event occurred to influence the current state.