* Assignment Specifications / Brief

Logic Design $\rightarrow$ SCCharts

I/O Physical Implementation $\rightarrow$ C (Nios II)

- General Specifications:

  - Defined & adjustable time-out values: (ms)

      - AVI, AEI, PVARP, VRP, LRI, URI

  - Implement behaviour of pacemaker (DDD, see pacemaker beh spec doc)

  - Two-mode — Selected via switch.

- Mode 1 Spec:

  - Event Simulation: KEY1 - Atrial events
    KEY0 - Ventricular events

  - AP, VP Output $\rightarrow$ Green on-board LEDs.

    (Extra LED illumination logic required)

  - Sample Test Criteria:

      - Only KEY1 $\Rightarrow$ Pace Ventricular at same rate

      - No KEY press $\rightarrow$ Pace A & V at same rate (appropriate)

* DDD Pacemaker Behaviour Specification

· **Aspects:**

- I/O: Pulse (Mode 1), Char ('A','V')(Mode 2)

  Inputs: — Atrial Sense   Outputs: — Atrial Pace
           — Ventricular Sense   — Ventricular Pace

- Pacing Method:

 | On Triggered: | On Inhibited: |
  |---|---|
  | - Pace when event is absent. (detected) | · - Pacing tree-running until event is present. (detected) |

- Timing Correlated Actions:

  - AVI: Max time between A event & subsequent V event.

  - AEI: Max time between V event & subsequent A event.

  - PVARP: Time post V event where any A event is ignored.

       -AR: Ignored A event

  - VRP: Time post A event where any V event is ignored.

       -VR: Ignored V event.

  - LRI: Min time heart is allowed to operate. (Rate)
           Time between V events.

  -URI: Max time pacemaker will ever pace. (Rate)
           Time between V events.

- ## Mode 2 Spec:

  - Bi-directional communication with virtual heart (CS303-Heart.exe)

    - Require non-blocking UART reads.

    - Virtual heart configurable to various disease states (see vheart spec)

    - Communicate via char characters: (A, V)

    Heart UART
    'A' ⇄ AS
        → AP
    'V' ⇄ VS   Pacemaker
        → VP
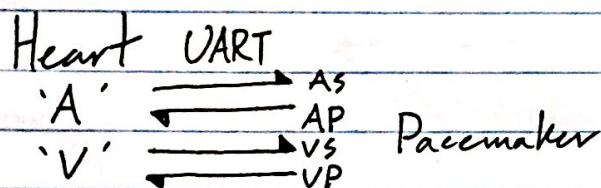
- ## Virtual Heart Spec. — Heart Emulator

  - Atrial + Ventricular EGM.

    - Positive: Natural, AS, VS

    - Negative: Artificial, AP, VP

  - Disease/Defect Simulation

  Right Atrium, Left A, SA, AV, AV Conduction, Bundle, Left V, Right Ventricle

    - SA Node Autorhythmic: Inherent initiation potential of cardiac cycle.

    'A' contract, then 'V' contract.

    - AV Node Autorhythmic: Receiver of SA action potential.

    Delay in 'A', before passing action to 'V'.

    - AV Conduction (Delay): AV bundle that acts as the only conductive connection
                             between 'A' & 'V'
    'V' action delay or blocking.