Anti-viral Therapeutic Design for HIV Control

Recent advancement in anti-viral drugs now allows many HIV infected patients to enjoy a higher quality of life due to the delay or prevention of the onset of AIDS. On the other hand, there is a limited supply and cost of anti-viral drugs, highlighting the importance to apply a minimum amount to achieve the desired objective of sustaining quality of life.

The HIV virus count is regularly obtained in check-up appointments. Your task is to develop a feedback control scheme that controls the virus count to below an acceptable value while minimizing the amount of anti-viral drug use.

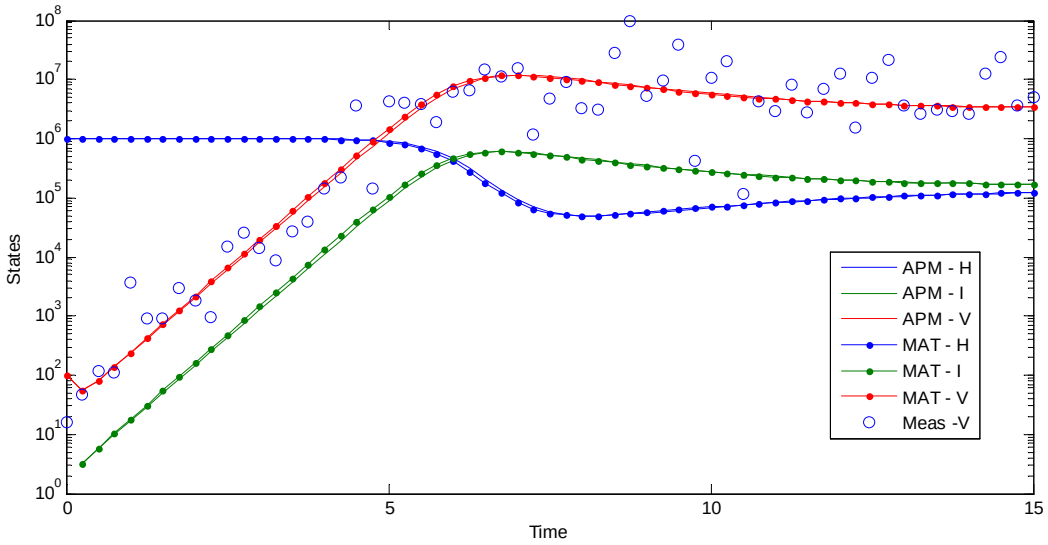
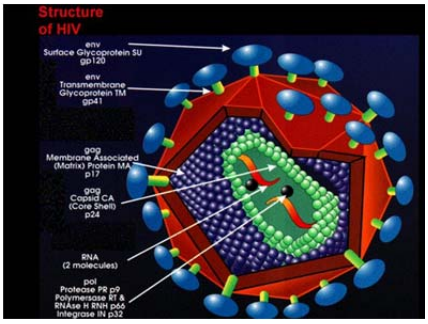


Fig 1. Simulation results for a the HIV dynamic model by Perelson [1].

References

Perelson, A.S, Kirschner, D.E., and De Boer, R., Dynamics of HIV Infection of $CD4^+$ T Cells, 1992.



Appendix A

Simulation model by Perelson [1]. This needs to be adapted to accommodate the anti-viral effect on the Healthy cells (H), Infected Cells (I), and the Virus Count (V).

```
Model
  Parameters
    kr1 = 1e5
    kr2 = 0.1
    kr3 = 2e-7
    kr4 = 0.5
    kr5 = 5
    kr6 = 100
  End Parameters
  Variables
    H = 1e6     ! healthy cells
    V = 1e2     ! virus
    I = 0       ! infected cells
  End Variables
  Equations
    $H = kr1 - kr2*H - kr3*H*V
    $I = kr3*H*V - kr4*I
    $V = -kr3*H*V - kr5*V + kr6*I
  End Equations
End Model
```