AMSC663 – Introduction

Jon Dehn

Why am I here?

- UMD's "Golden ID" program encourages "mature" Maryland residents to take college courses
- I couldn't get into CS 423

More specifically,

Classic Public Service Announcement:

This is your brain without Intellectual stimulation:

Personal

- Grew up in upstate New York (Schenectady)
- Went to school at Brown University:
  - Bachelors in Applied Math
  - Masters in Computer Science

Personal…

- Live in Montgomery County
- Built my house in 1980

Personal…

- Two adult children (UMD graduates) and one daughter in law

Interests

- Soccer fan (Go Terps!)
- Music, including still playing after all these years.

Professional

- Started working at IBM in 1977
- IBM's Federal Systems Division was sold to the Loral Corporation in 1995
- Loral was bought by Lockheed Martin in 1999
- Retired from Lockheed Martin in 2016

Professional…

- Most of my work has been in Air Traffic Management systems
- Some in
  - National Archives
  - Border Protection
  - F35 Logistics

ATM systems…

- Are ground based systems that provide Air Traffic Controllers (people) with tools to safely and efficiently move aircraft from point A to point B
- Are highly available (no scheduled downtime)
- Are distributed (typical installation has 20 servers and 150 workstations)

ATM Systems…

- One key element of an ATM system is to estimate where each airplane will be over time. To do that, the climb and descent profile must be estimated:

$$ROCD = \frac{dH_p}{dt} = \frac{(T - \Delta T)}{T} * \frac{(Thr - D) * V_{TAS}}{mg_0} \left[1 + \langle\frac{V_{TAS}}{g_0}\rangle\langle\frac{dV_{TAS}}{dh}\rangle\right]^{-1}$$

ROCD = rate of Climb or Descent = change in pressure altitude
T = Atmospheric temperature
ΔT = temperature differential from standard temp
Thr = Thrust
D = Drag
M = mass of aircraft
g0 = standard gravity
dh = change in altitude

reference “Eurocontrol User Manual for the Base of Aircraft Data”

ATM trajectories

- Given the filed flight plan, and the profile of climb and descent, a 4 dimensional trajectory (latitude, longitude, altitude, time) is created
  - Trajectory consists of a series of straight line segments in 4D space
- This has to be recomputed periodically as winds change, aircraft speed varies, etc.

ATM Systems…

- Another tool given to controllers is a “conflict detection service”
  - Will any two aircraft violate the minimum separation standards?
  - If so, controllers assess the situation and issue flight plan changes to one or both pilots
  - This process compares all trajectory segments of one flight with against all other flights