AMSC663 – Introduction

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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.

This is your brain on drugs.

**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:

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

ROCD = rate of Climb or Descent = change in pressure altitude
T = Atmospheric temperature
\Delta T = 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