IMGD 3000 - Technical Game Development I:
Iterative Development Techniques

by
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Motivation

- The *last* thing you want to do is write critical code near the end of a project
  - Induces *huge* stress on the team
  - Introduces all kinds of *interesting bugs* that break working code

- Testing *always* gets cut in a crunch
  - Makes the problem *even worse!*

- Planning can help avoid writing critical code in alpha or beta phases
Wishes Versus Reality

- Most games you play are less/smaller than originally envisioned
  - Design was bigger than implementation
  - Implementation was bigger than what actually made it into the game

- How do we know when a game is "done"?
How Do We Estimate Progress?

- Example:
  - Jo is a programmer
  - She estimates it will take 10 days to implement a Smart Trap
  - She is 4 days into the implementation
  - Is the Smart Trap 40% complete?
    - We may not see it "snap shut" until day 9
  - Say she is good, and finishes in 8 days total
    - We are ahead!
  - Later, it is decided to add functionality to the Smart Trap (e.g., can trap larger objects)
    - This takes 4 days
  - Now we’re behind!
So, What’s the Point?

- Most things get revisited multiple times during development
  - Fix bugs, modify functionality, etc.
- The "40% done" estimate looks pretty sketchy...
- We need a way to account for time without driving a project into trouble (and into panic)
Incremental Delivery

- Milestones are good things!
  - They let us get things done

- Downside
  - If you miss one, people notice, and action is often taken
  - Especially management and production people
Incremental Delivery (cont.)

- Developer’s view
  - Milestones (or plans in general) are just best guesses for how the implementation will evolve

- Management’s view
  - Schedules are contracts with developers
  - Promising certain things at certain times

- These different views cause problems
  - Developers: Panic, pressure, long hours
  - Managers: Justification, financial pressure
Milestones

- Without milestones, work will not get done
- *Unrealistic* milestones mean the work will not get done on time, regardless of how financially important they are
- Managers need to know the estimates of the developers, and the key markers along the way
  - They need to plan their financial links accordingly
Milestones (cont.)

- External (used by managers) milestones are at a coarser granularity
  - Need to tie to publishers, etc.

- Internal (used by developers) milestones are at a finer granularity
  - Need to use among team members
Milestones (cont.)

- Think of the development plan as a blackbox
  - Managers have a specific "interface" to the box
    - Give me the latest build
    - Give me the latest (high-level) schedule

- Clearly, this is too simplistic/wishful thinking
  - Managers want to know more

- But it helps separate things better
Hidden Gems

- For many, if I can’t see it, it is not important
  - AI takes time to build
  - Network balancing is an optimization

- Developers receive less "credit" for these than things that can be seen

- Good managers will probe deeper below the surface to see what is really going on
  - Requires technical ability (knowledge)
Iteration

- Make frequent (daily, weekly?) working builds
  - "We don’t go home Friday until a working build is checked in."
  - If management asks for the latest build, give them the one from last week

- Resist the desire to show the latest-and-greatest
  - People will always expect it, and it leads to unrealistic expectations
Internal Scheduling

- Given a detailed design document
  - Make a list of all objects (players, items, NPCs, environments, etc.) that need to be built
  - Mark each one as either
    - Core,
    - Required, or
    - Desired.
  - Remember the circle diagram?

- End result
  - List of features sorted by importance
Internal Scheduling (cont.)

- Could start working from top of list, and when time runs out, we are done
  - Produces a lot of complete pieces, but no whole
  - Makes management (and others) nervous

- Since we made the list in an OO way, we should start building objects!
O0 Iterative Development: Object Versions

- Create a *Null* version for each object
  - Complete, but empty

- *Basic* version
  - Placeholder with some properties present

- *Nominal* version
  - Commercially viable implementation

- *Optimal* version
  - State of the art version

```cpp
// Player.h
class Player { 
  public:
    Player( void );
    ~Player( void );
};

//Player.cpp
#include "Player.h"

Player::Player( void ) {
}

Player::~Player( void ) {
}
```
OO Iterative Development: Object Versions (cont.)

- Some objects will be simpler
  - Fewer iterations

- Some will be more complex
  - More iterations

- We can say we have a **shippable** game when every object is at least at the **Nominal** version

- A **complete** game is one where all objects are at **Optimal** level
Discussion

☐ Seems like we need to write *three* versions of every object!
  ■ Yes, but we would probably do this anyway with revisions

☐ Approach
  ■ Starting with core, then required, then desired, implement *Null* versions of all objects
  ■ Starting with core, then required, implement the *Nominal* versions
    ■ Code is now *releasable*
  ■ Start to work on desirables
Discussion (cont.)

- This is a breadth-first approach
- Better than "let's do the cool bits first!"
  - Always have a build-able game
  - Near-continuous growth
  - Can easily show refinement
  - Better handle on how "complete" the game is
Scheduling: Naïve

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### Scheduling: Better (single programmer)

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Scheduling: Better (multiple programmers)

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Team Utilization

- Make sure to use the skills of each team member well
  - All eggs in one basket
  - Jack of all traits, master of none

- Keep everyone busy
  - Now waiting, if possible

- Communication is vital
  - Every programmer should be aware of what others are doing
    - Code reviews
    - Joint status meetings
    - Documentation
Scheduling:
Eggs in one Basket

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Scheduling with Iteration

- **Shift:**
  - FROM: When will it be finished?
  - TO: When will it be good enough?

- "Finished" is meaningless anyway

- We have a definition of "Good Enough" now!

- Bad estimation often comes from top-down dissection
  - No accounting for the learning curve, code revision, or integration

- **Iterative development**
  - Total time equals the sum of the Null, Base, Nominal, and Optimal levels