IFN501 - System Modeling and Simulation

Session 1: Course Overview

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Outline

Course Details

Introduction to Computer Simulation

Next Session

References

Acknowledgement

When not specifically defined, the contents of this presentation are adapted from [1].

The Rules of the Game

1. You can attend the class anytime you want, but to sign the *List of Attendees* you should not come more than 15 minutes since the class started.
2. You should attend $>$ 80% of the meetings to get the final grade.
3. Accepted communication lines: danielsengkey@unsrat.ac.id, e-Learning message.
4. If you and your friend have something to be discussed please do it outside the class, except you are assigned to do so.
5. If you have a question, please raise your hand anytime during the class. No need to wait until the class finished.
6. Plagiarism in assignments will be rated as 0. If you cheating and/or plagiarizing in final test/assignment you will have '**E**' as your final grade.
7. You are college students, please behave with the appropriate attitude.

Scoring Components

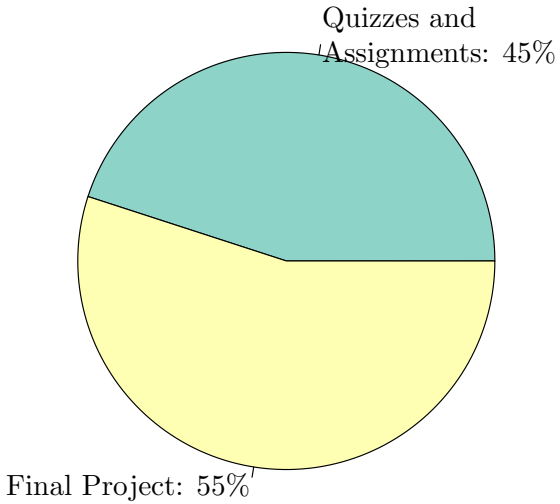


Figure 1 : Scoring components

- Grading system follows faculty regulation:
  - $n \geq 80$ Grade = A
  - $75 \leq n < 80$ Grade = B+
  - $70 \leq n < 75$ Grade = B
  - $65 \leq n < 70$ Grade = C+
  - $55 \leq n < 65$ Grade = C
  - $35 \leq n < 55$ Grade = D
  - $n < 35$ Grade = E

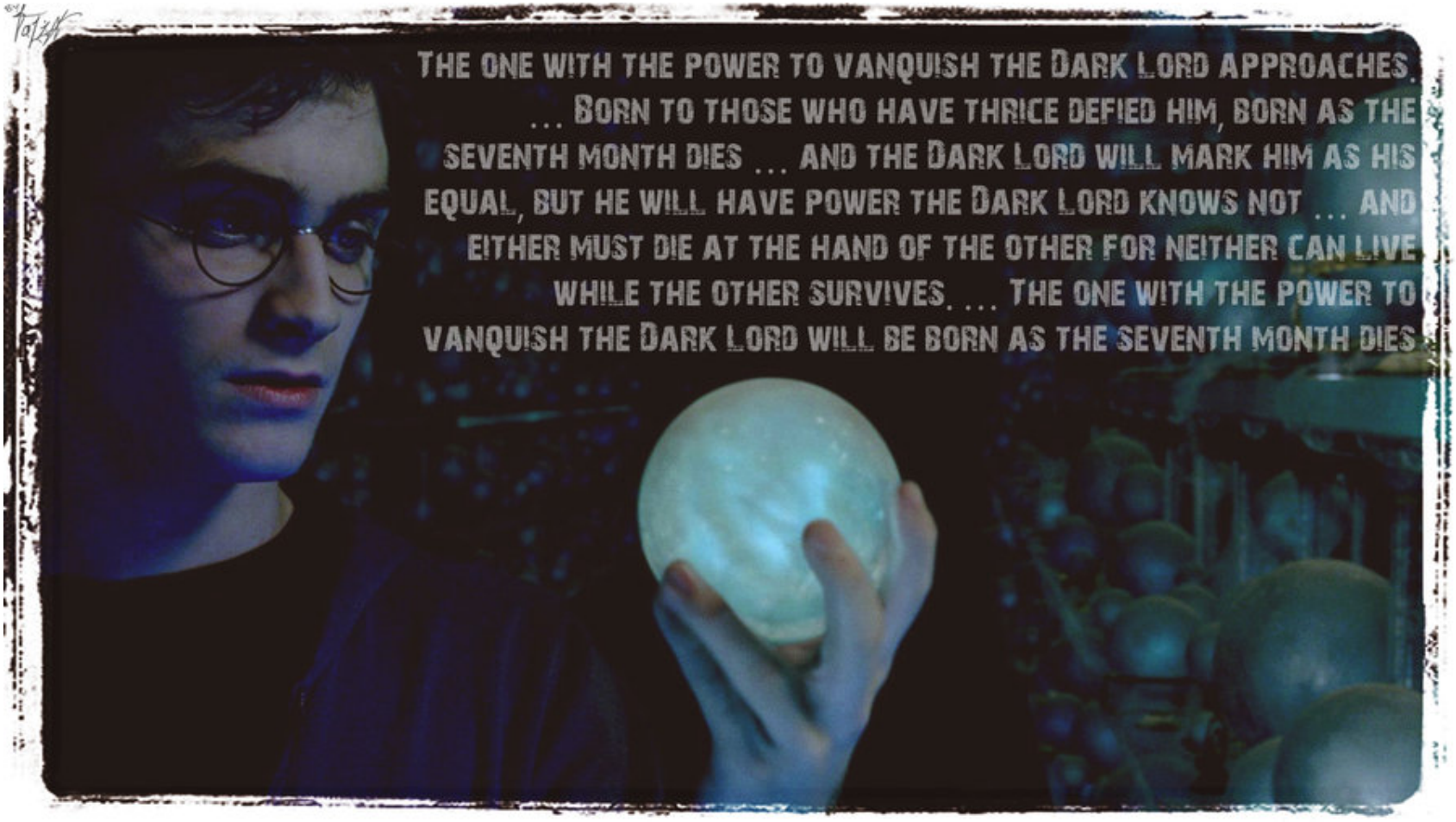
Introduction to Computer Simulation

Why it is important?

- Reduce the risk associated with creating new systems or with making alteration to the existing ones.
- Investment assurance
- Decreasing margin of error while increasing precision

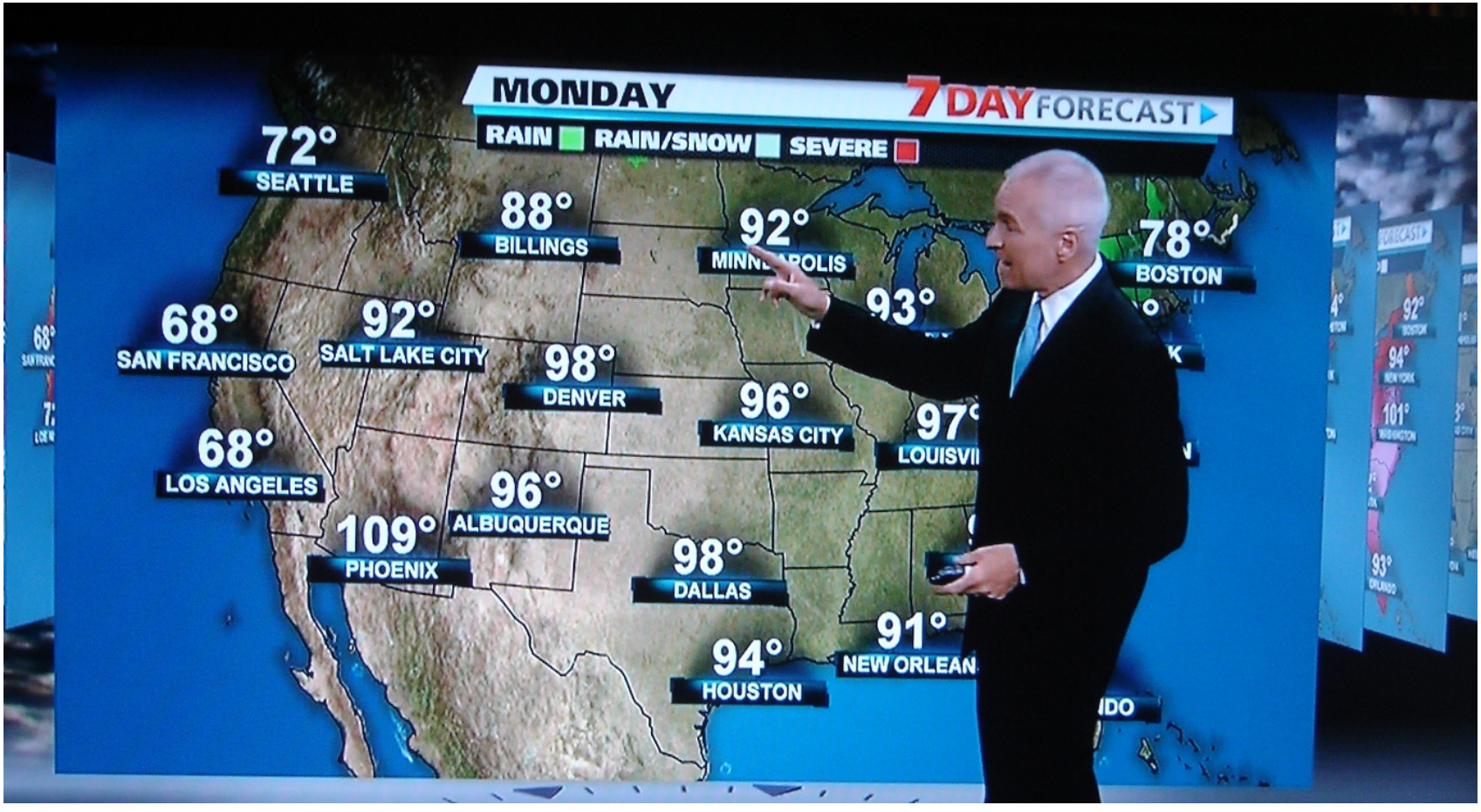
Introduction to Computer Simulation

Simulation Defined



Introduction to Computer Simulation

Simulation Defined



Introduction to Computer Simulation

Simulation Defined- Basic Nature

- Branch of applied mathematics
- Exploits computing power and improvements in programming languages to solve complex real world system that modeled as analytical or purely mathematical models
- The challenge is about how to accurately model the real world system

Definition

Using a computer to imitate the operation of a real world process or facility according to appropriately developed assumptions taking the form of logical, statistical, or mathematical relationships which are developed and shaped into a model.

Introduction to Computer Simulation

Simulation Defined- Usages

Table 1 : Situations warranting computer simulations

General Situation	Examples
Real system does not yet exist and building a prototype is cost prohibitive, time-consuming or hazardous.	Aircraft, production system, nuclear reactor
System is impossible to build.	National economy, biological system
Real system exists but experimentation is too expensive, hazardous or disruptive to conduct.	Proposed Changes to a Materials Handling System, Military Unit, Transportation System, Airport Baggage Handling System
Forecasting is required to analyze long time periods in a compressed format.	Population growth forest fire spread, urbanization studies, pandemic flu spread
Mathematical modeling has no practical analytical or numeric solution.	Stochastic problems, nonlinear differential equations

Pros

1. Allows experimentation without disruptions to the existing systems.
2. Concept can be evaluated before installation.
3. Detection of unforeseen problems or bugs.
4. Gain in knowledge on system
5. Speed in analysis
6. Force system definition
7. Enhances creativity

Cons

1. Expensive
2. Time consuming
3. Only produces approximate answers
4. Difficult to validate
5. Accepted as gospel

Next session: Assignment 1 – Paper and Presentation

- Topic: Cases Around Us and The Needs for Computer Simulation.
- Form groups of 3 or 4 students.
- Find a case that suits the topic and discuss it with your group.
- Submit a paper that reports your case and the result of your discussion. Paper formatting should comply to the IEEE Conference format.
- Each group has 5-7 minutes to present the case and the findings.
- The presentation contains only the important points. DO NOT copy-paste the text in your paper to the slides. Such presentation will be REJECTED!

Next session: Assignment 1 – Paper and Presentation

Paper Outline

- Abstract
- Introduction
  - Explain some backgrounds about the general needs for computer simulation.
  - Give some hints about the field of study of your case (e.g. which branch of science it belongs to).
  - Outline: mention the following sections, and topic that discussed within each section.
- The case study
  - Start with explaining your case. Use deductive approach.
  - Continue with the complexity of your case.
  - Relate the complexity and the needs for computer simulation to solve the case.
  - Give an example of the simulation scenario for that particular case.
- Conclusion: conclude your paper.
- Reference/Bibliography

Next session: Assignment 1 – Paper and Presentation

Presentation Outline[1]

- Slide 1: cover – presentation title and group members.
- Slides 2-3: Background
- Slides 4-7: The case study
- Slide 8: Conclusion

[1] This is merely a hint. The numbers are not to be strictly followed.

References I

[1] R. McHaney, Understanding Computer Simulation. Ventus Publishing, 2009.