Software Engineering

Lecture 1

(We can't run the modern world without software.)

- Because of the lack of physical constraints, software systems can quickly become extremely complex, difficult to understand, and expensive to change.

Software Failures

1. ***Increasing demands*** : Systems have to have new capabilities that were previously thought to be impossible. Therefore, software engineering methods cannot cope and new software engineering techniques have to be developed to meet new these new demands in the system.
2. ***Low expectations***: It is relatively easy to write computer programs without using software engineering methods and techniques. Consequently, their software is often more expensive and less reliable than it should be. We need better software engineering education and training to address this problem.

Professional Software Development

- Software is not just the programs themselves but also all associated documentation and configuration data that is required to make these programs operate correctly.
- If you are writing a program for yourself, you don't have to worry about writing program guides and documenting. **However**, if you are writing software that other people will use and other engineers will change then you usually have to provide additional information as well as the code of the program.

Frequently asked questions about software engineering

Question	Answer
What is software?	Computer programs and associated documentation. Software products may be developed for a particular customer or may be developed for a general market.
What are the attributes of good software?	Good software should deliver the required functionality and performance to the user and should be maintainable, dependable and usable.
What is software engineering?	Software engineering is an engineering discipline that is concerned with all aspects of software production.
What are the fundamental software engineering activities?	Software specification, software development, software validation and software evolution.
What is the difference between software engineering and computer science?	Computer science focuses on theory and fundamentals; software engineering is concerned with the practicalities of developing and delivering useful software.

Software products

There are two kinds of software products:

1. ***Generic products*** : These are stand-alone systems that are produced by a development organization and sold on the open market to any customer.
2. ***Customized products*** : These are systems that are commissioned by a particular customer.

Software Engineering

Software engineering is an engineering discipline that is concerned with all aspects of software production from the early stages of system specification through to maintaining the system after it has gone into use.

1. ***Engineering discipline*** : They apply theories, methods, and tools where these are appropriate.
2. ***All aspects of software production***: Not just technical process of development. Also project management and the development of tools, methods etc…, to support software production.

Important of the software engineering

1. It produces reliable and trustworthy systems economically and quickly.
2. It is usually cheaper, in the long run.

Software process activities

- **Software specification**, where customers and engineers define the software that is to be produced and the constraints on its operation.
- **Software development**, where the software is designed and programmed.
- **Software validation**, where the software is checked to ensure that it is what the customer requires.
- **Software evolution**, where the software is modified to reflect changing customer and market requirements.

General issues that affect most software

1. ***Heterogeneity*** : Running the software on general-purpose computers.
2. ***Business and social change*** : They need to be able to change their existing software and to rapidly develop new software.
3. ***Security and trust*** : We have to make sure that malicious users cannot attack our software and that information security is maintained.

Software applications

- There are many different types of software system and there is no universal set of software techniques that is applicable to all of these.
- The software engineering methods and tools used depend on the type of application being developed, the requirements of the customer and the background of the development team.

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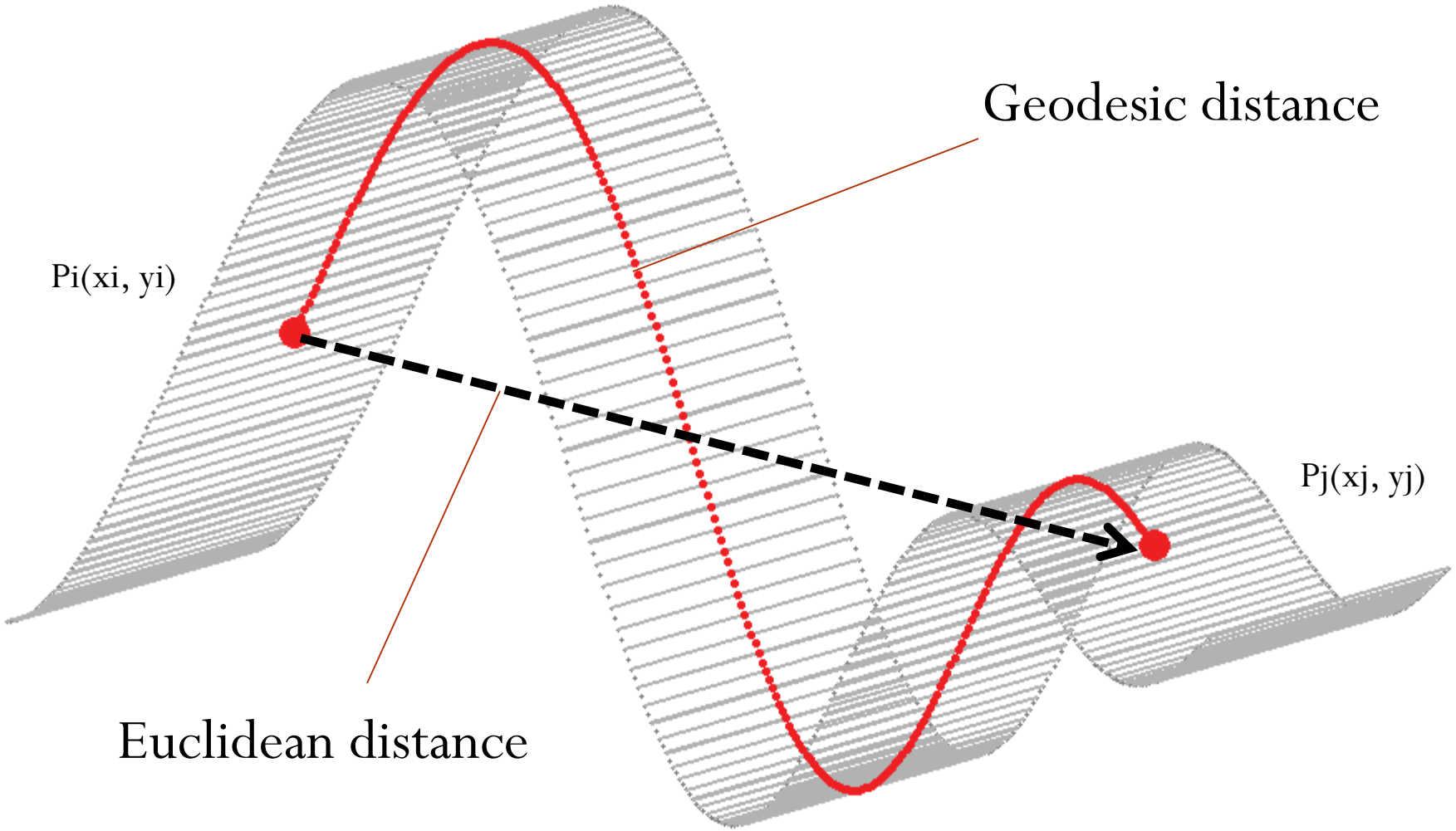
What are the different between Academic software and other software? Explain

Conclusion

- Software engineering is an engineering discipline that is concerned with all aspects of software production.
- Essential software product attributes are maintainability, dependability and security, efficiency and acceptability.
- The high-level activities of specification, development, validation and evolution are part of all software processes.
- The fundamental notions of software engineering are universally applicable to all types of system development.

Conclusion

- There are many different types of system and each requires appropriate software engineering tools and techniques for their development.
- The fundamental ideas of software engineering are applicable to all types of software system.


Geodesic distance
Pi(xi, yi)
Pj(xj, yj)
Euclidean distance