Arrow Diagramming Method (ADM)
(Activity On Arrows (AOA) Method)
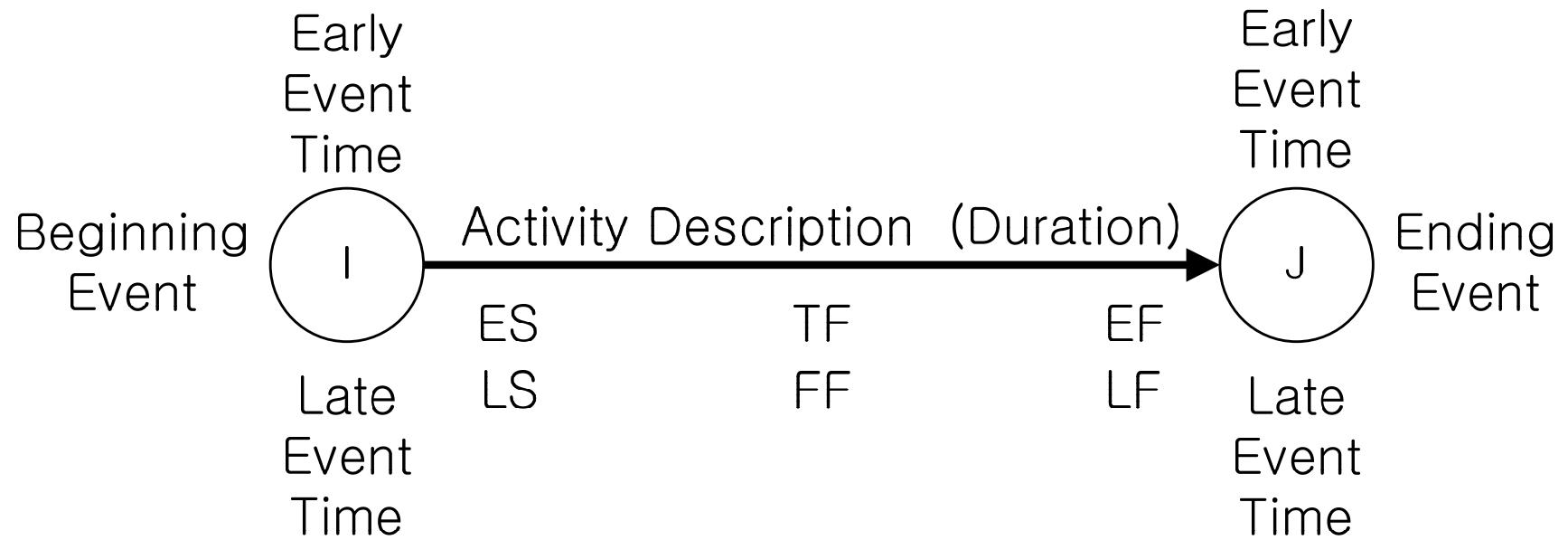
Construction Project Management

2013. 4.9.
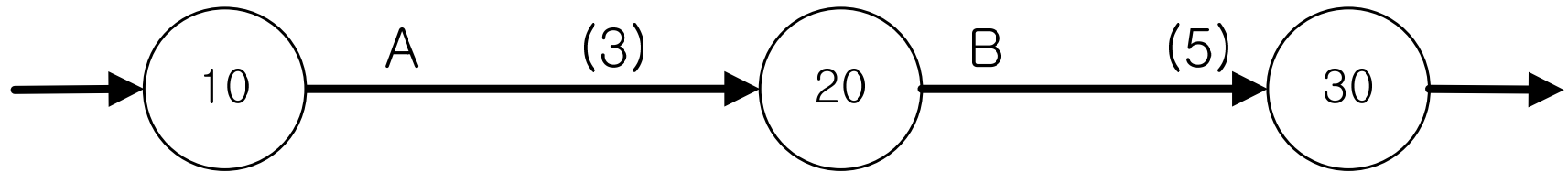**Hyoungkwan Kim, PhD, PEng**
Yonsei University

Terminologies

- Early Start (ES)
- Late Start (LS)
- Early Finish (EF)
- Late Finish (LF)
- Event
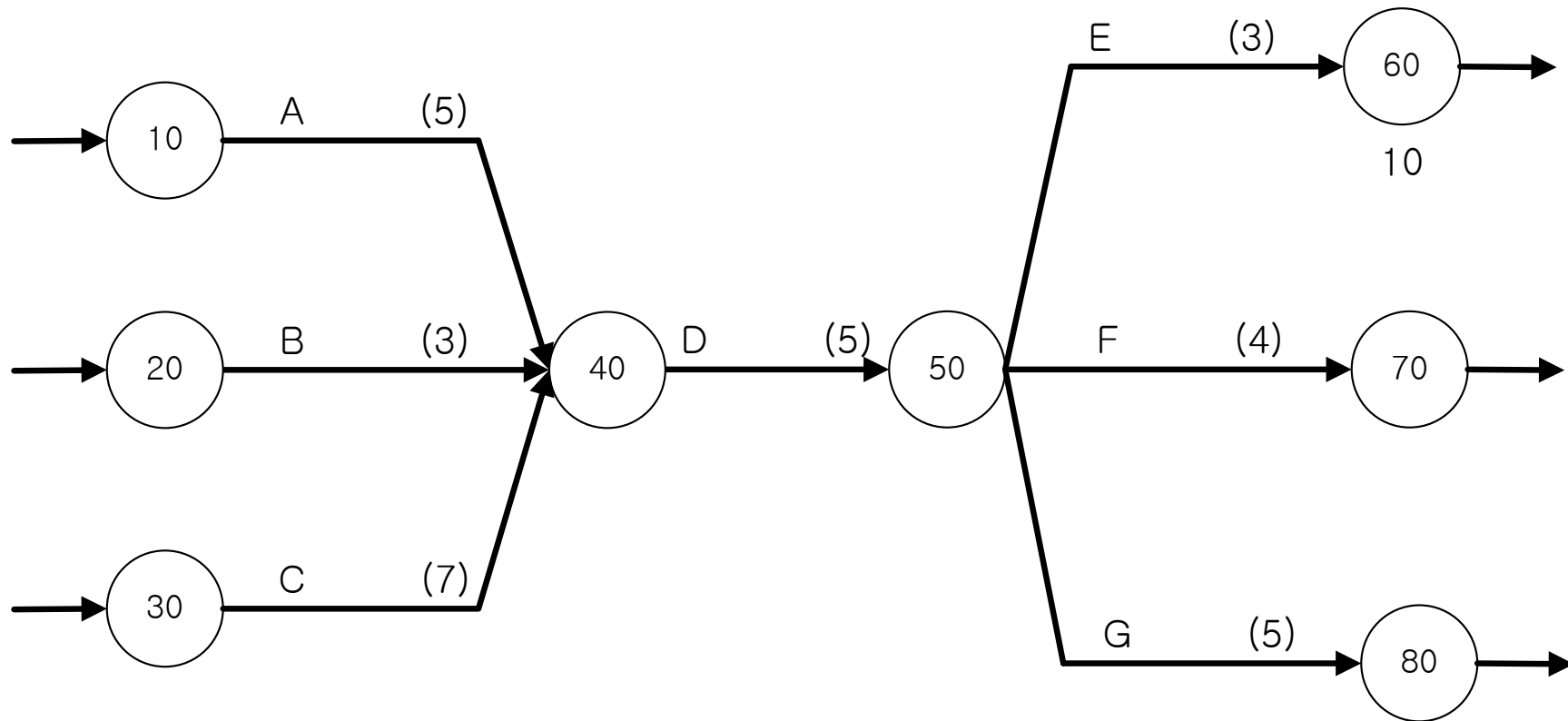- Early Event Time (EET)
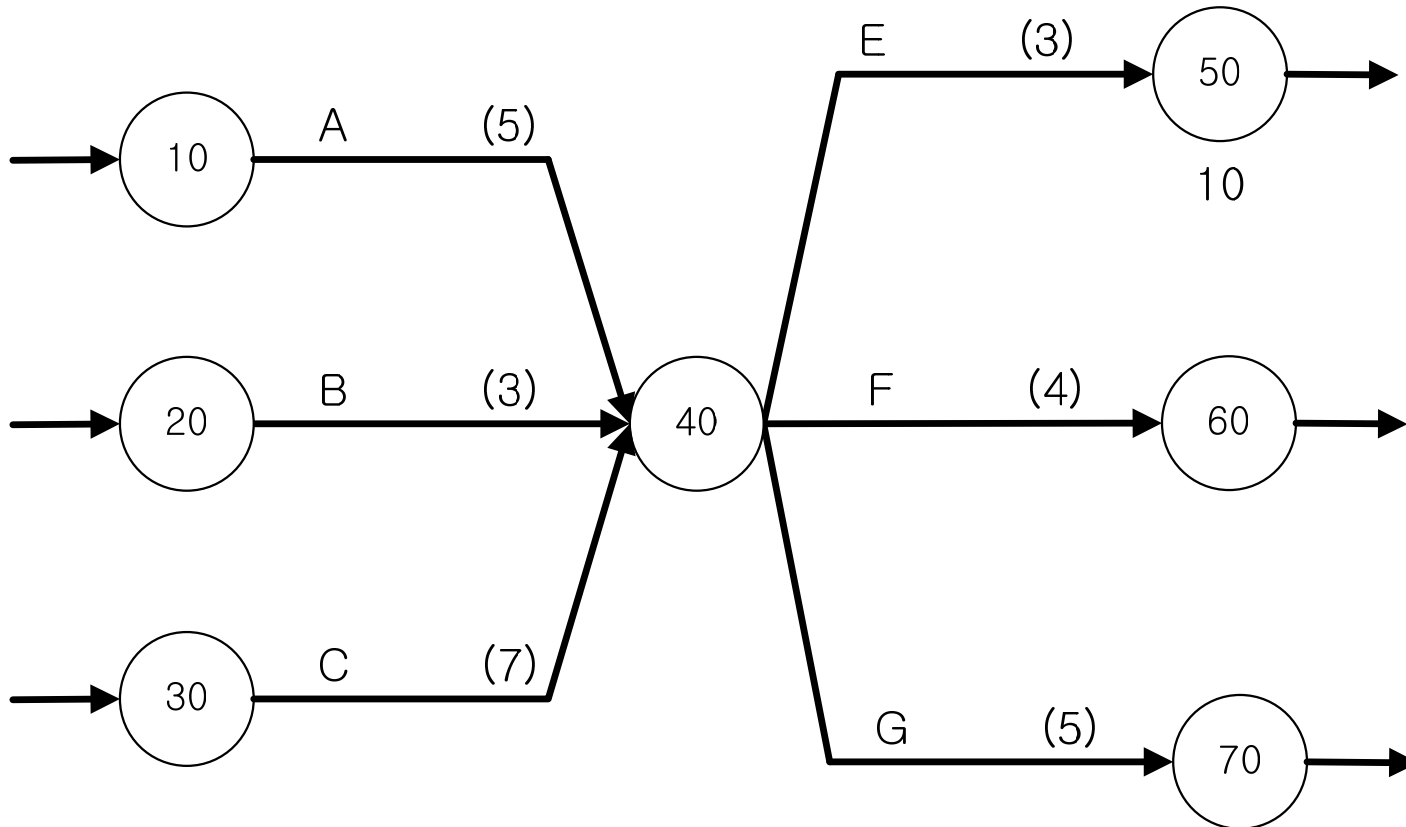- Late Event Time (LET)
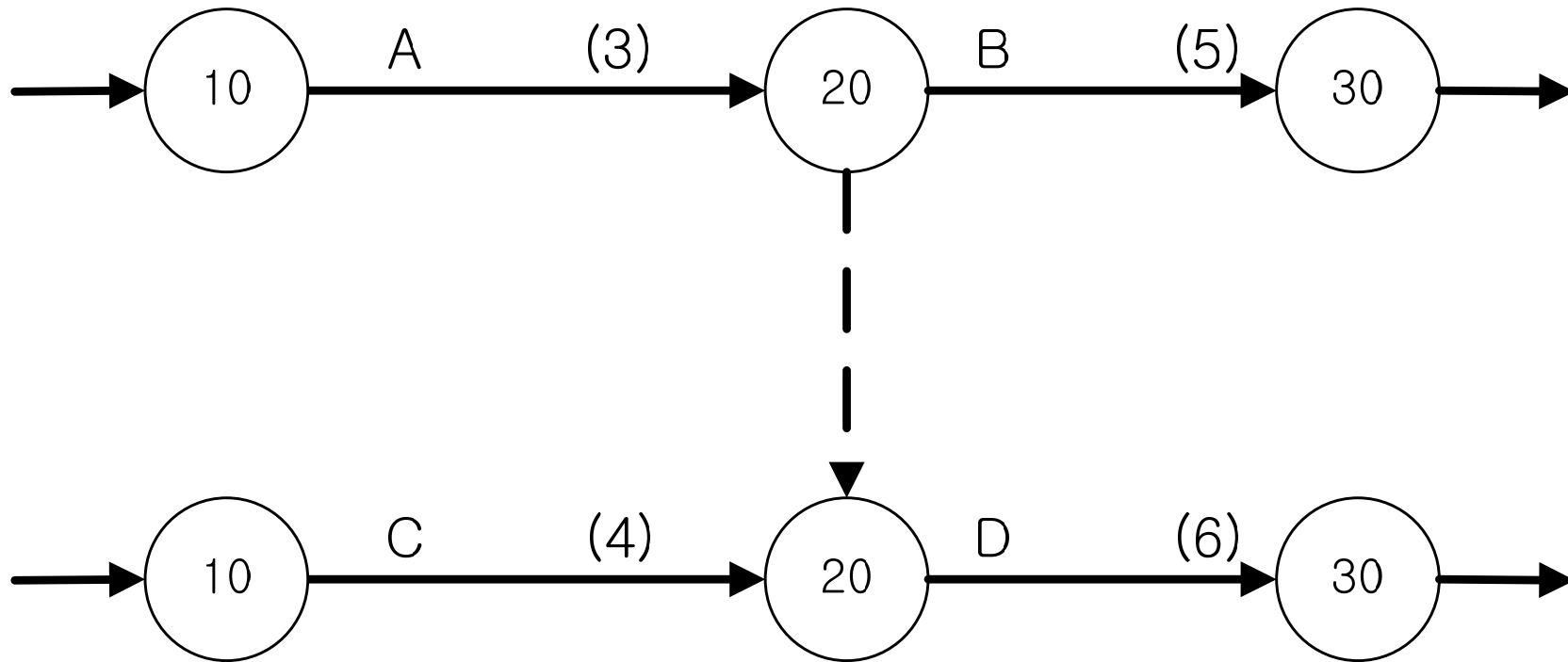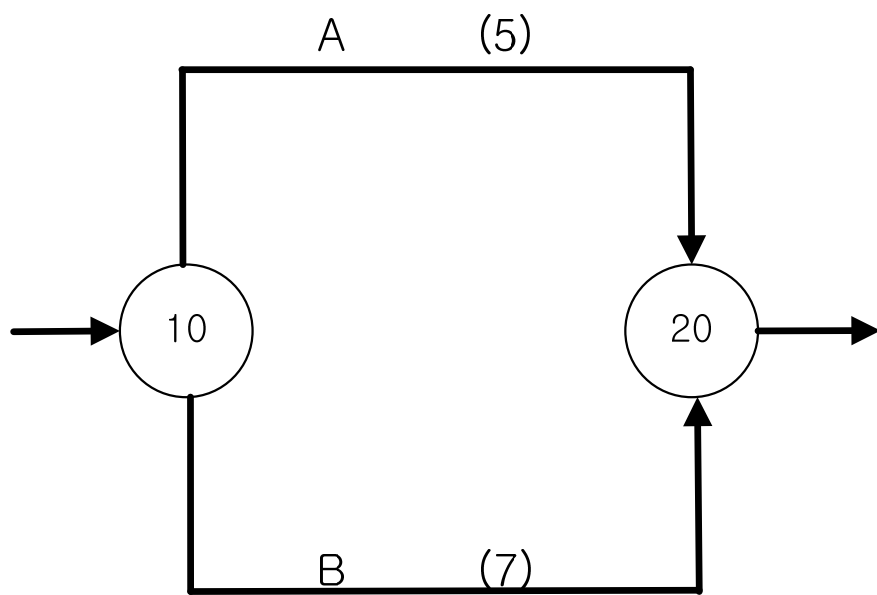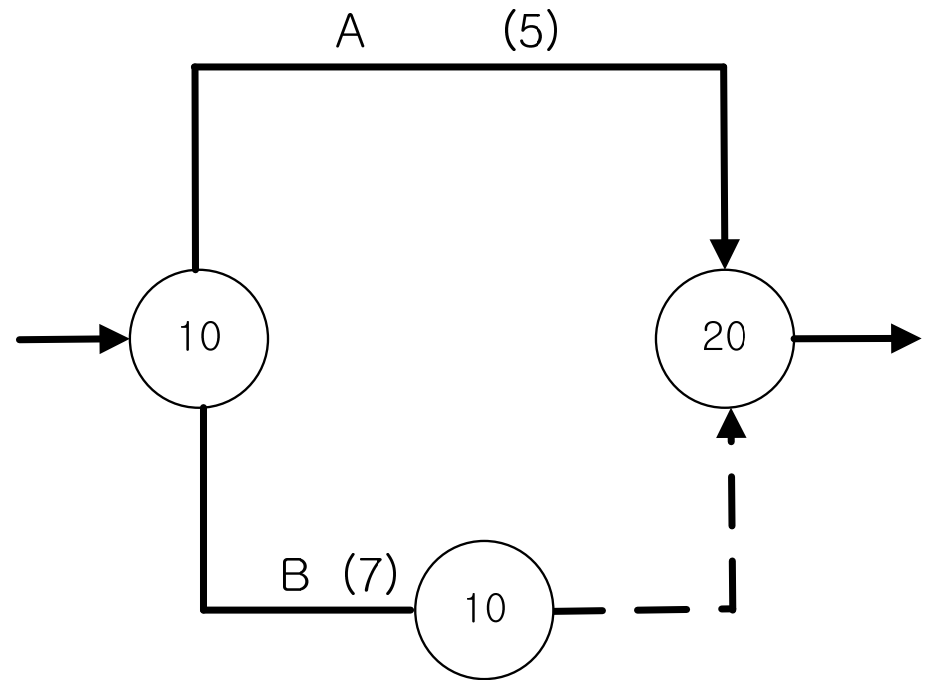
AOA Notation

Predecessor and Successor

Merge and Burst

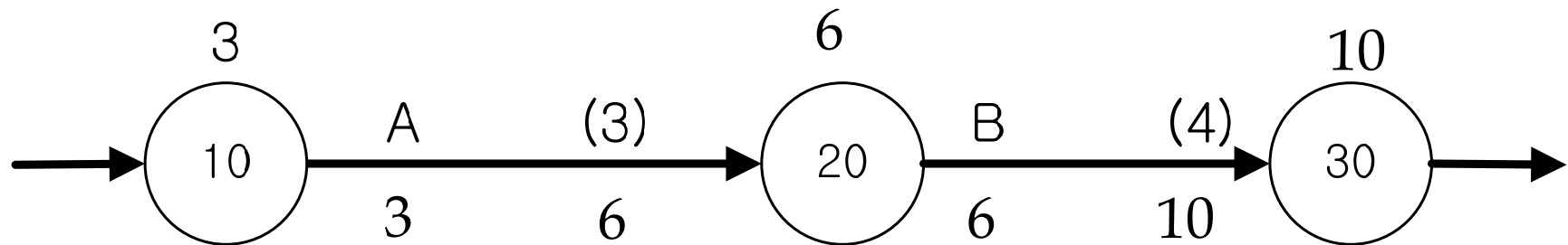# Cross

Dummy Activities

Need for Dummy Activities

ES, EF, and EET example

ES, EF, and EET example
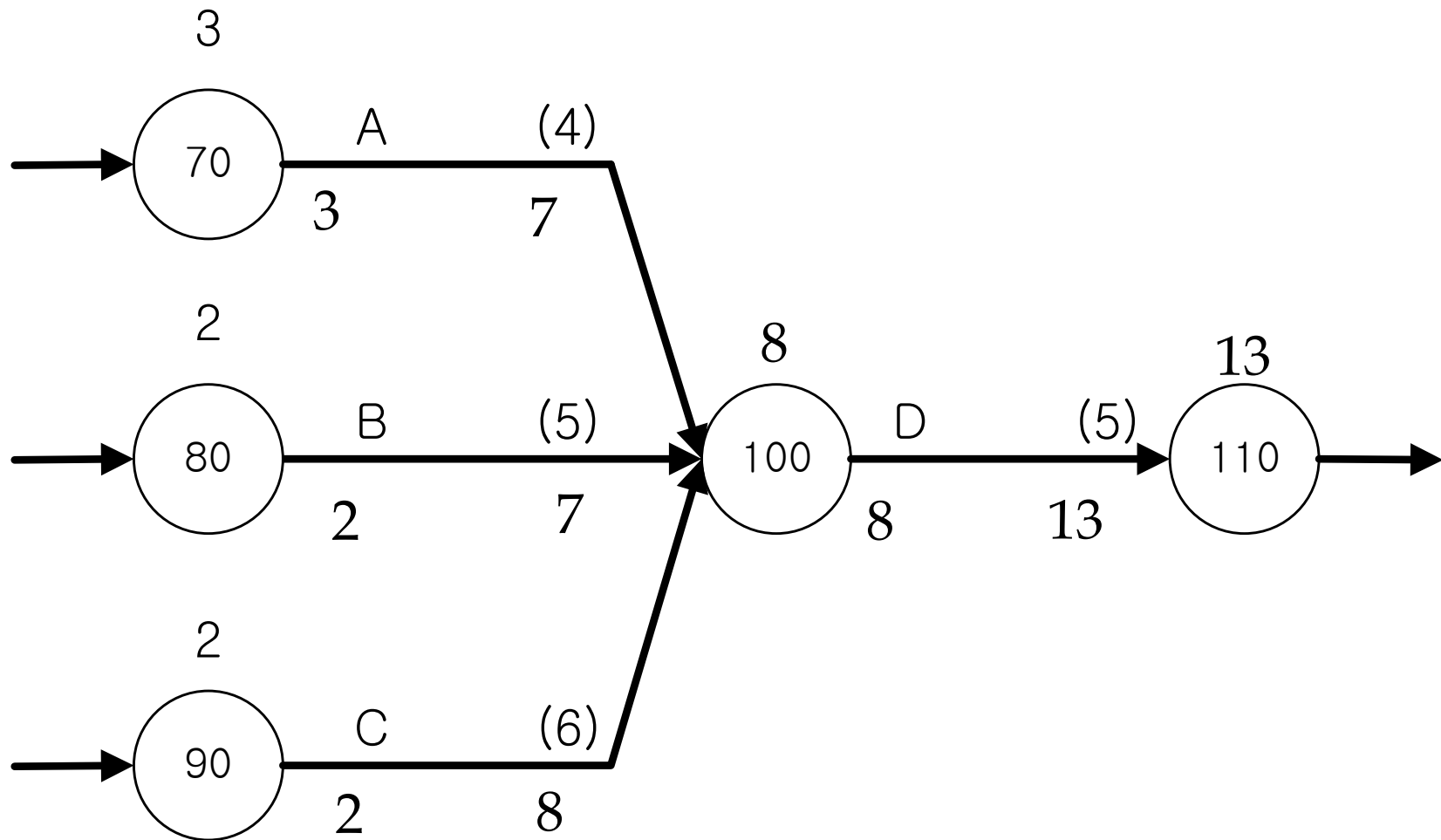
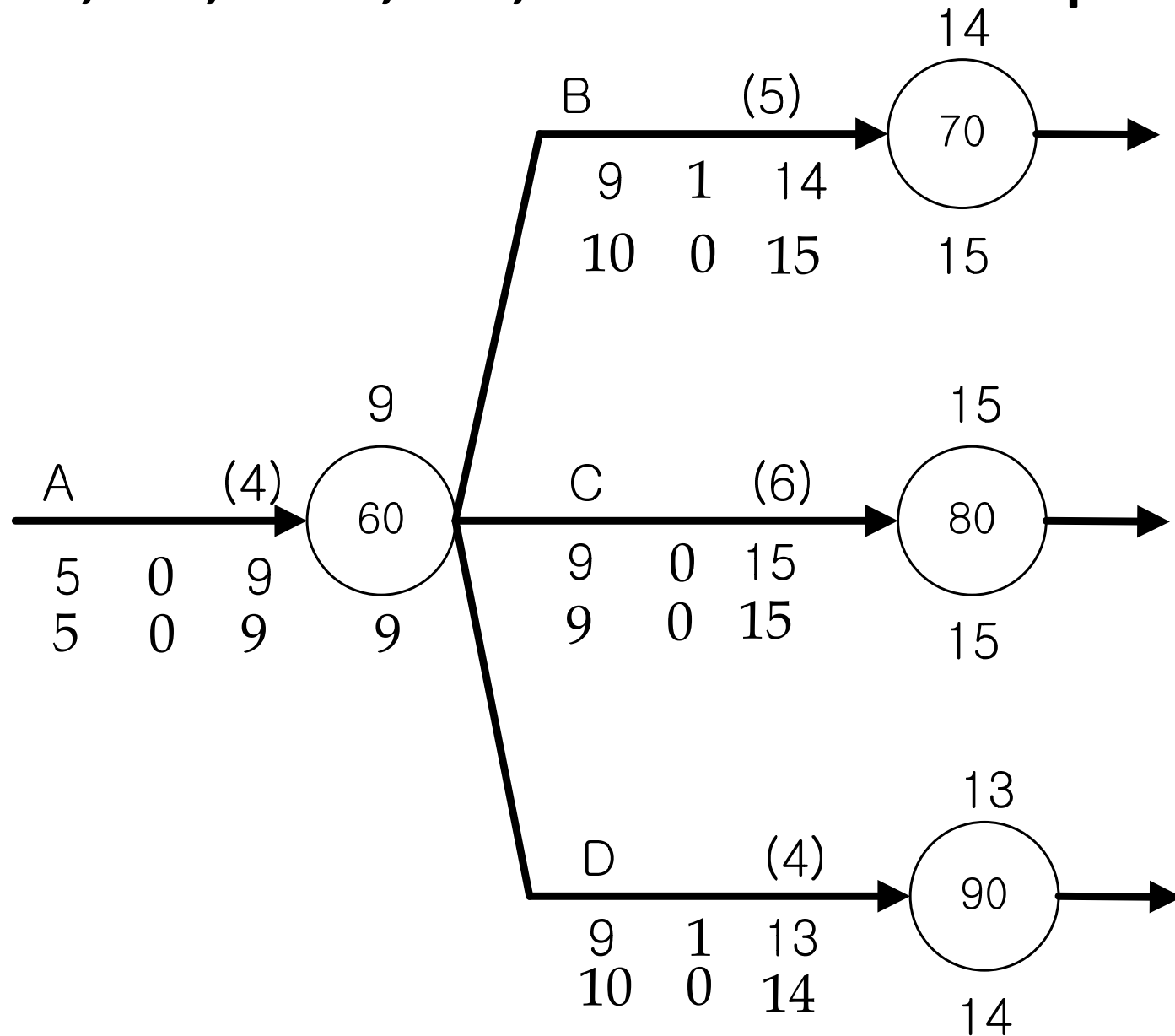# LS, LF, LET, TF, and FF example
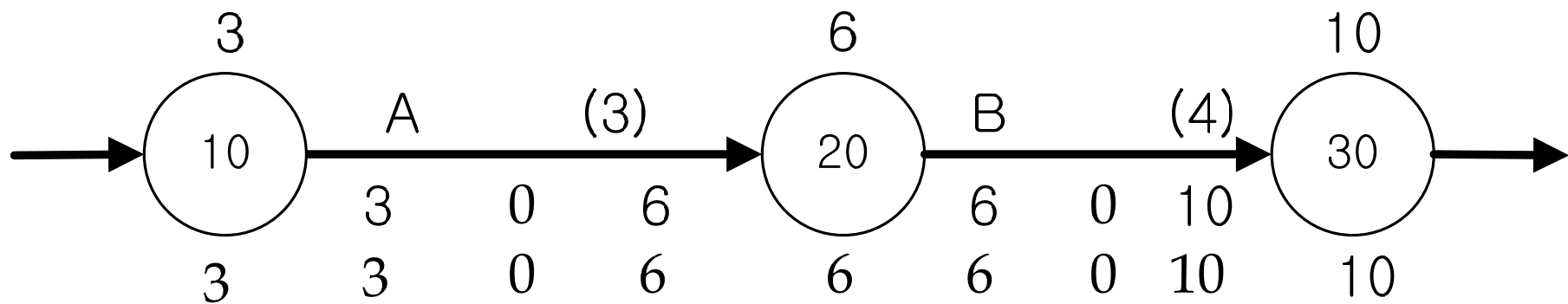
LS, LF, LET, TF, and FF example

ADM Computation Example

PDM vs. ADM

- ## PDM(AON)
  - Four types of dependencies
  - No dummy activities
  - Widely used today
  - The length of arrow does not mean the duration
- ## ADM(AON)
  - Finish to start relationship only
  - Dummy activities
  - Widely used in the past
  - The length of arrow can mean the duration

History of CPM

- 1956: E.I. du Pont de Nemours company started R&D group – New Mgmt. Techniques
- 1957: Kelly Walker Method (Basic CPM) – UNIVAC Application Research Center
- 1958: Great success was achieved in a test case
- 1959: CPM was presented to the public
- 1960 ~ 65: CPM caption replaced Kelley Walker (Main Chain Technique)
- 1965 ~ 70: CPM was recast into PDM
- 1970 ~ 80: This decade saw the evolution of CM and increase in construction litigation citing delay as a cause of damages
- 1980 ~ 89: CPM software development for PC systems

Source: Popescu and Charoenngam 1994

Advantages and Limitations of CPM

Advantages

- Improvement in
  - communication
  - scope definition
  - work assignment
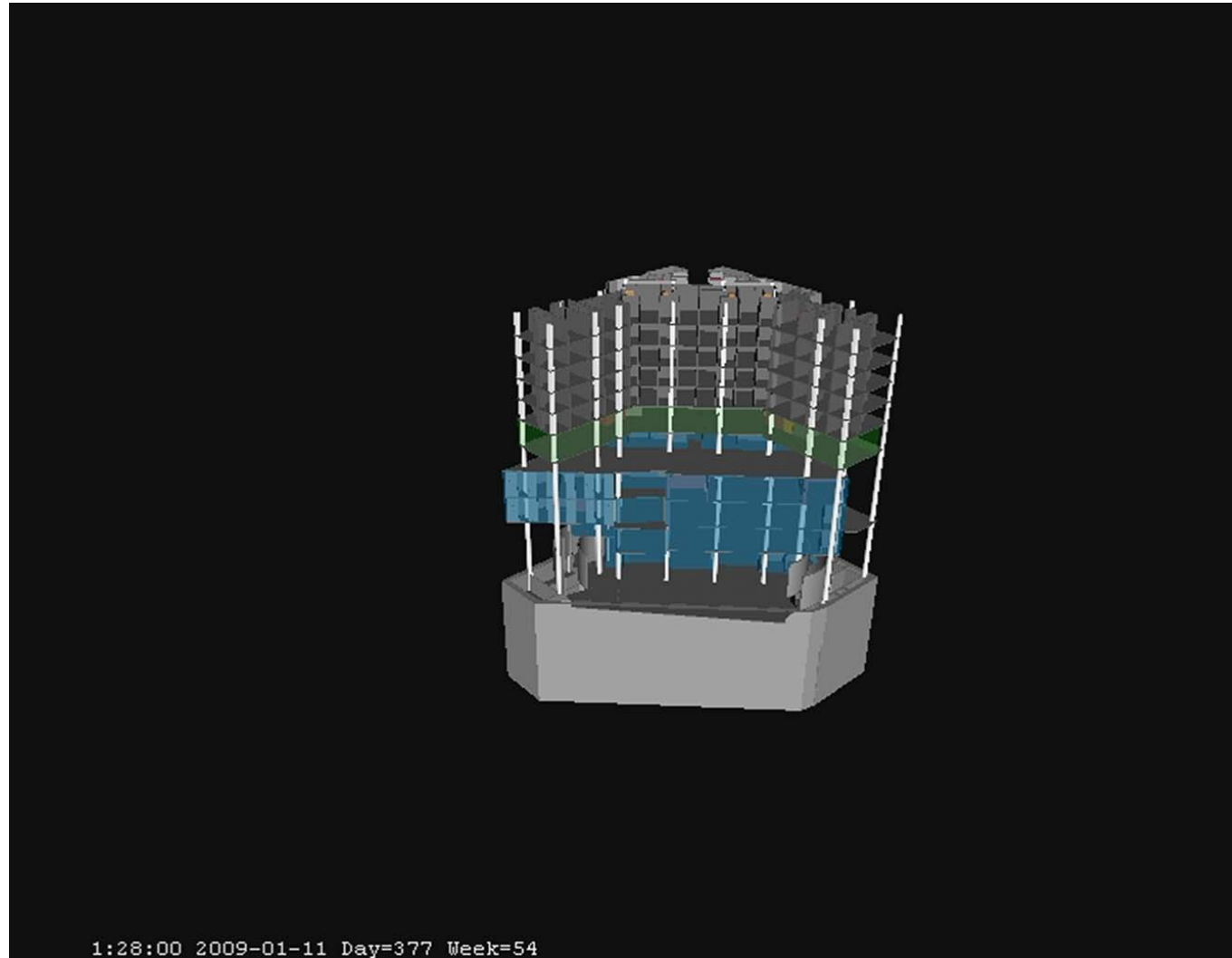 - documentation
  - Time-cost-resource correlation

Limitations

- Difficult to develop
- Difficult to update
- Difficult to visualize the process
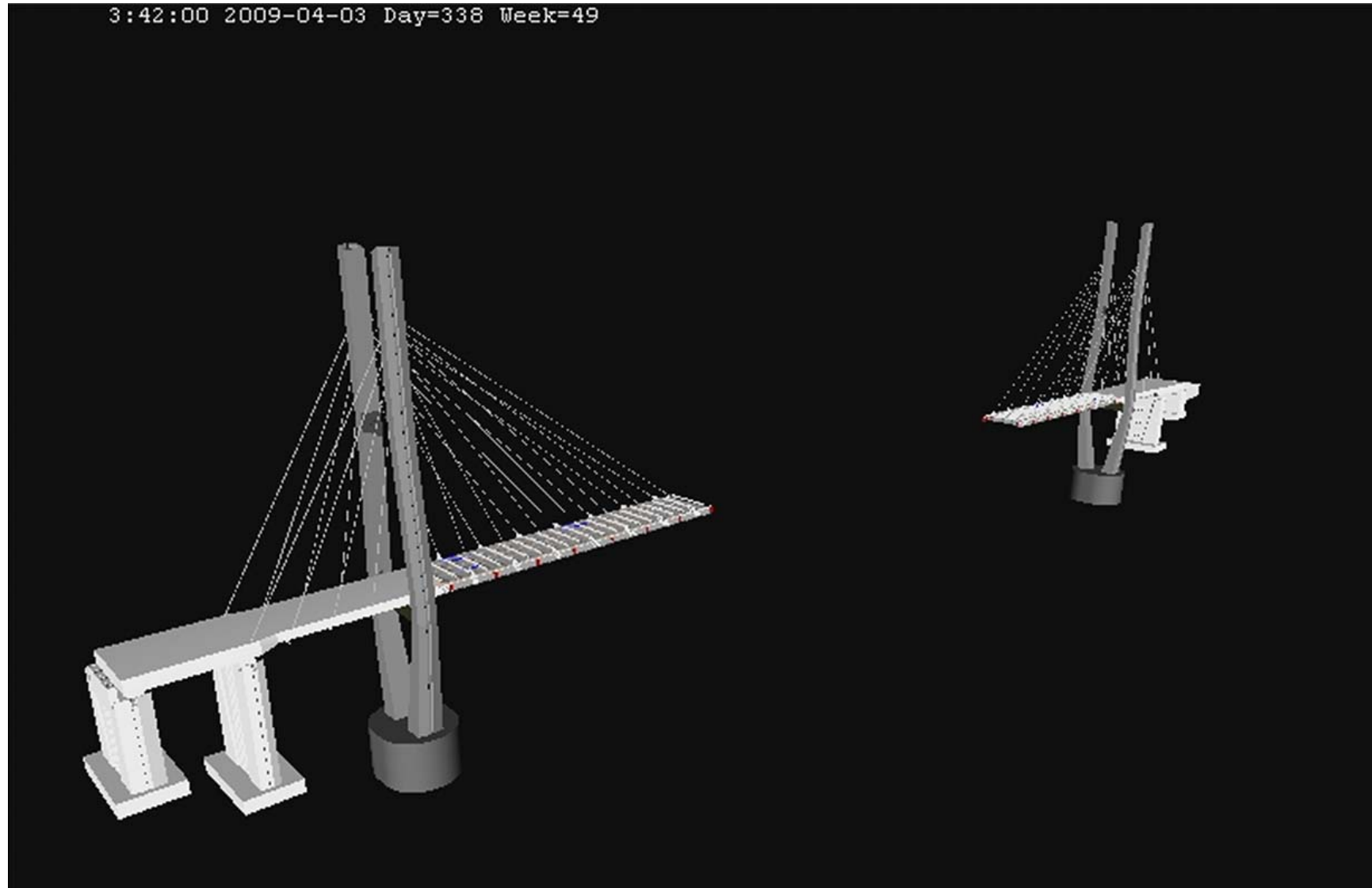
Many contractors use CPM just for contractual reasons

Building Information Modeling (BIM) / 4D Visualization


1:28:00 2009-01-11 Day=377 Week=54

Jung Jun Park, Byungil Kim, Changyoon Kim, and Hyoungkwan Kim (2011). "3D/4D CAD Applicability for Life Cycle Facility Management" Journal of Computing in Civil Engineering, 25(2), 129—138.

BIM / 4D Visualization

Changyoon Kim, Hyoungkwan Kim, Taekwun Park, and Moon Kyum Kim (2011). "Applicability of 4D CAD in Civil Engineering Construction: Case Study of a Cable-Stayed Bridge Project" Journal of Computing in Civil Engineering, 25(1), 98—107.

Process Simulation Combined with BIM
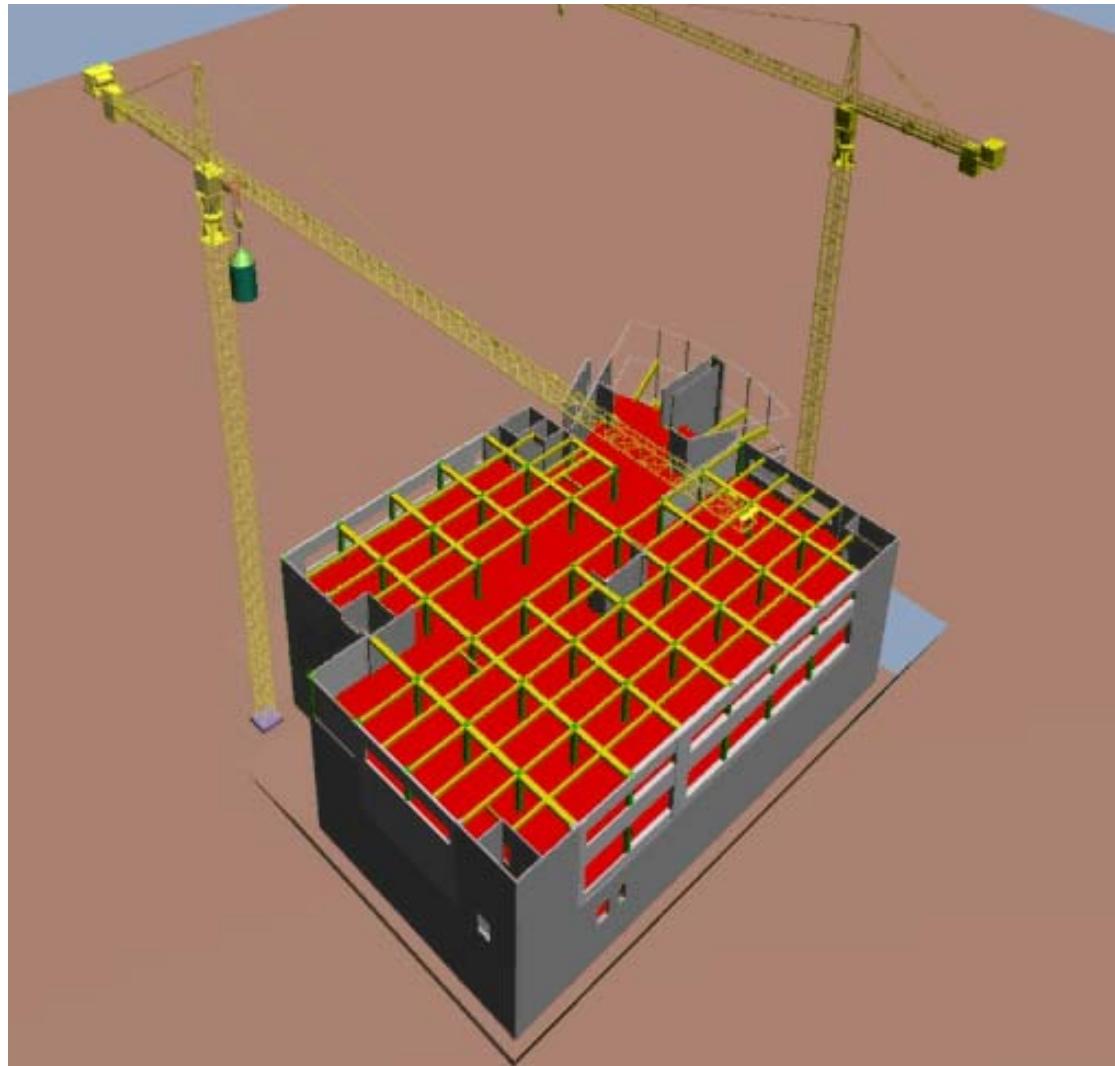
Mohamed Al-Hussein, Muhammad Athar Niaz, Haitao Yu, and Hyoungkwan Kim (2006). "Integrating 3D Visualization and Simulation for Tower Crane Operations on Construction Sites" Automation in Construction, 15(5), 554—562.

Automated Site Monitoring
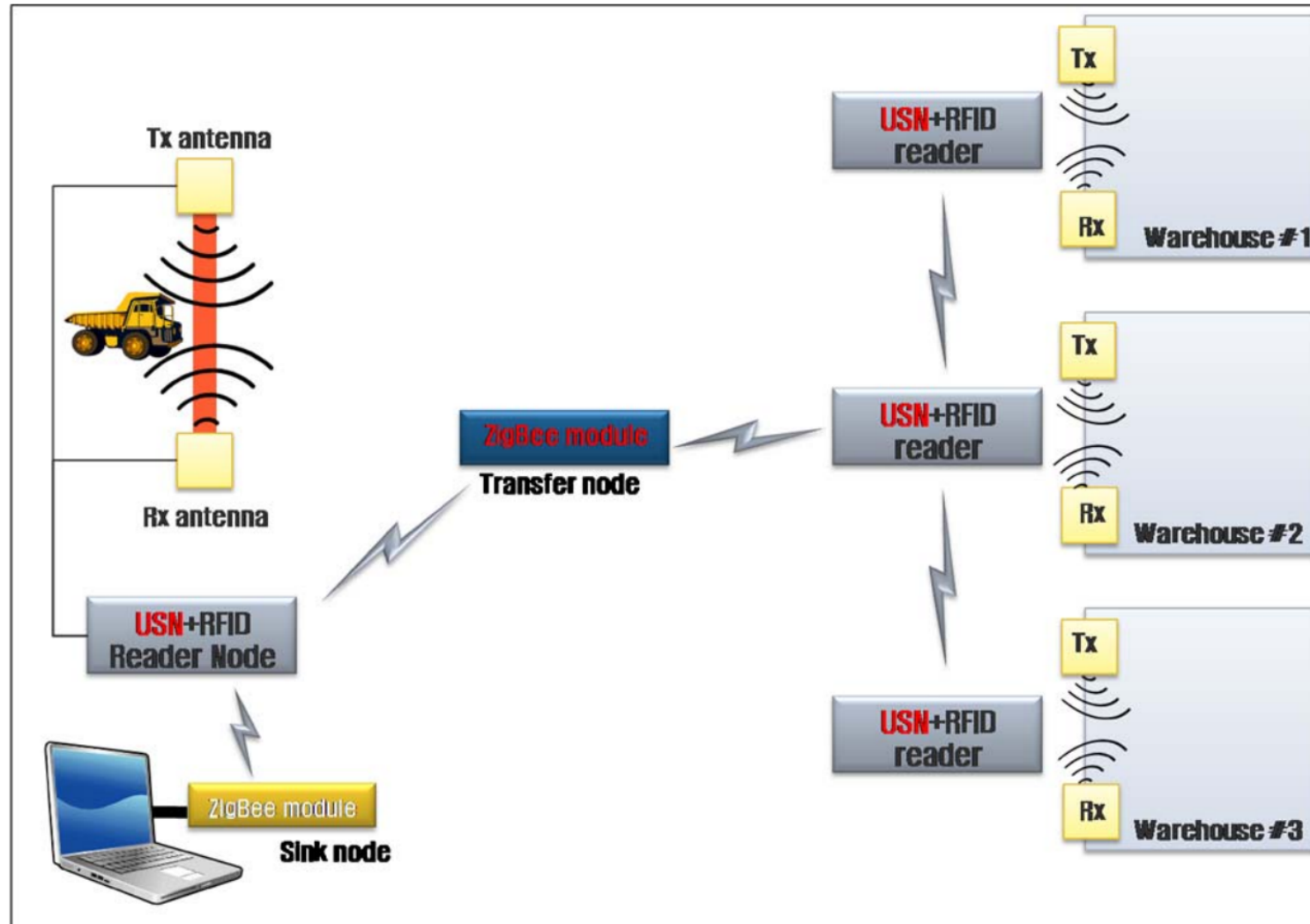
Changyoon Kim, Hyoungkwan Kim, Jeoungpil Ryu, and Changwan Kim (2011). "Ubiquitous Sensor Network for Construction Material Monitoring" Journal of Construction Engineering and Management, 137(2), 158—165.