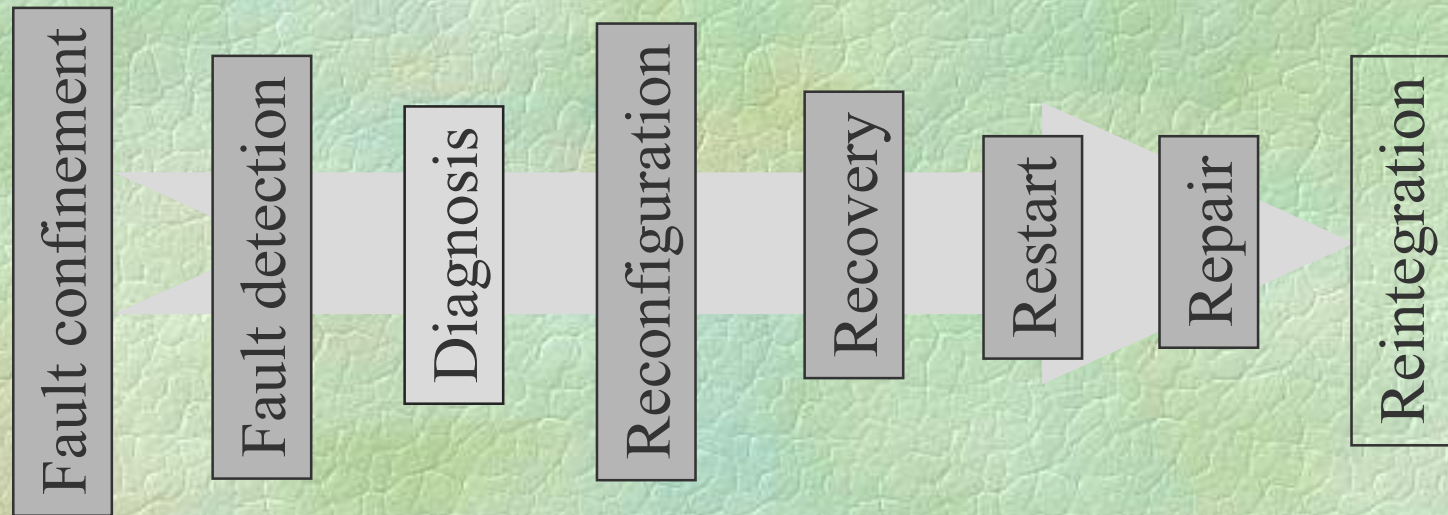


# Diagnosis

849 Dependable Embedded System

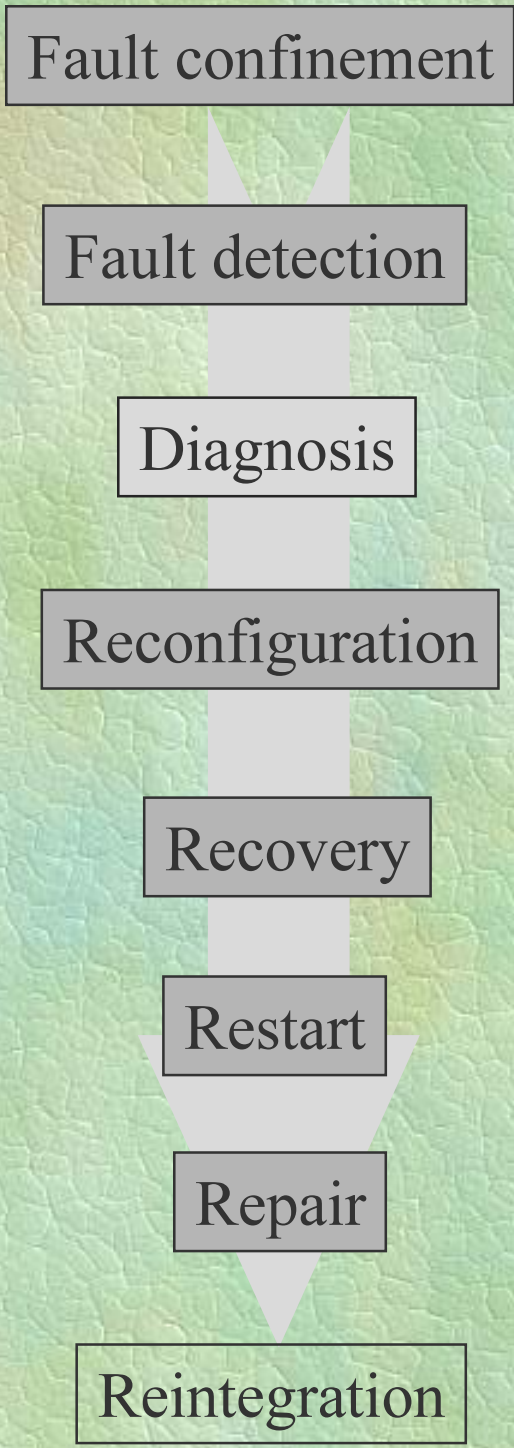
-- *Ying Shi*

# Techniques towards FTC



- ☛ “*Diagnosis* become necessary if the *Fault detection* technique does *not* provide information about the failure *location* and/or *properties*.”  
(ref.1)

# Techniques towards FTC



# Outline

- ☛ What's Diagnosis/Prognosis (D/P)
- ☛ Types of D/P
- ☛ D/P and testing
- ☛ Connections with other topics
- ☛ Conclusion and future work
- ☛ Reference list

# What is Diagnosis/Prognosis

- ☞ (fault) Diagnosis -- the action of determining the cause of an error in location and nature.
  - *(dictionary : Diagnosis -- investigation or analysis of the cause or nature of a condition, situation, or problem)*
- ☞ Prognosis(dict.) -- the prospect of recovery as anticipated from the usual course of disease or peculiarities of the case
  - *(forecast ...)*

# Retrospective *v.s.* Predictive

## ☞ Types of diagnosis

- Retrospective
- Predictive

## ☞ Retrospective Diagnosis

- determine what caused a system failure / “what happened”
- quick revival of fallen system

## ☞ Predictive Diagnosis/Prognosis

- determine when a failure will occur / “what if”
- preventive maintenance, increase perceived system reliability

# Spec.-based *v.s.* Symp.-based

- ☞ Two basic approaches
  - specification based + symptom based (Maxion and Siewiorek,85)
- ☞ Specification based diagnosis
  - design specification as expected behavior
  - testing, “black box”, is the core
- ☞ Symptom based diagnosis
  - information captured in system event logs and RT monitoring data
  - base judgement on evaluations of system behavior

# D/P - Testing

## ☞ Testing

- a measurement procedure
- goal : provide info to determine whether or not a unit responds to a stimulus in accordance with a prespecified standard

## ☞ Diagnosis

- a constrained search procedure
- goal : guide the administration of test, testing results often used diagnostically to provide additional symptomatic evidence for deciding which further test to perform



## D/P - Testing (*cont.*)

- ☛ In practice, testing and diagnosis are often mixed indistinguishably, and diagnosis is more difficult

# Connection

Ultra-Dependability

Maintenance &  
Reliability

**Diagnosis/Prognosis**

## ☞ Maintenance & Reliability

- essentialness for successful maintenance, thus further an user perceived reliability increase

## ☞ Ultra-Dependability

- given a more emphasized role

# Conclusion and Future Work

- ☛ Diagnosis should not be separately considered from Testing
- ☛ But pay attention to the difference
- ☛ Predictive diagnosis, Symptom-based diagnosis appears more plausible, thus evokes more interests for future work

# Reference List

## ☛ Book

- Reliable Computer System Design and Evaluation 2nd Edition  
*Siewiorek and Swarz*
  - definition and classification of diagnosis
  - a lot testing issues are addressed when talking SpecB
  - SympB diagnosis is based on the classification of fault/failure
  - sense the trend preferring predictive diagnosis

## ☛ Journal

- FTCS *mostly 22th and 23rd*