

Automated Random Tests



Lars Wahlberg

92-97 Saab Military Aircraft

97-99 FMV (JAS39)

99-06 OMX

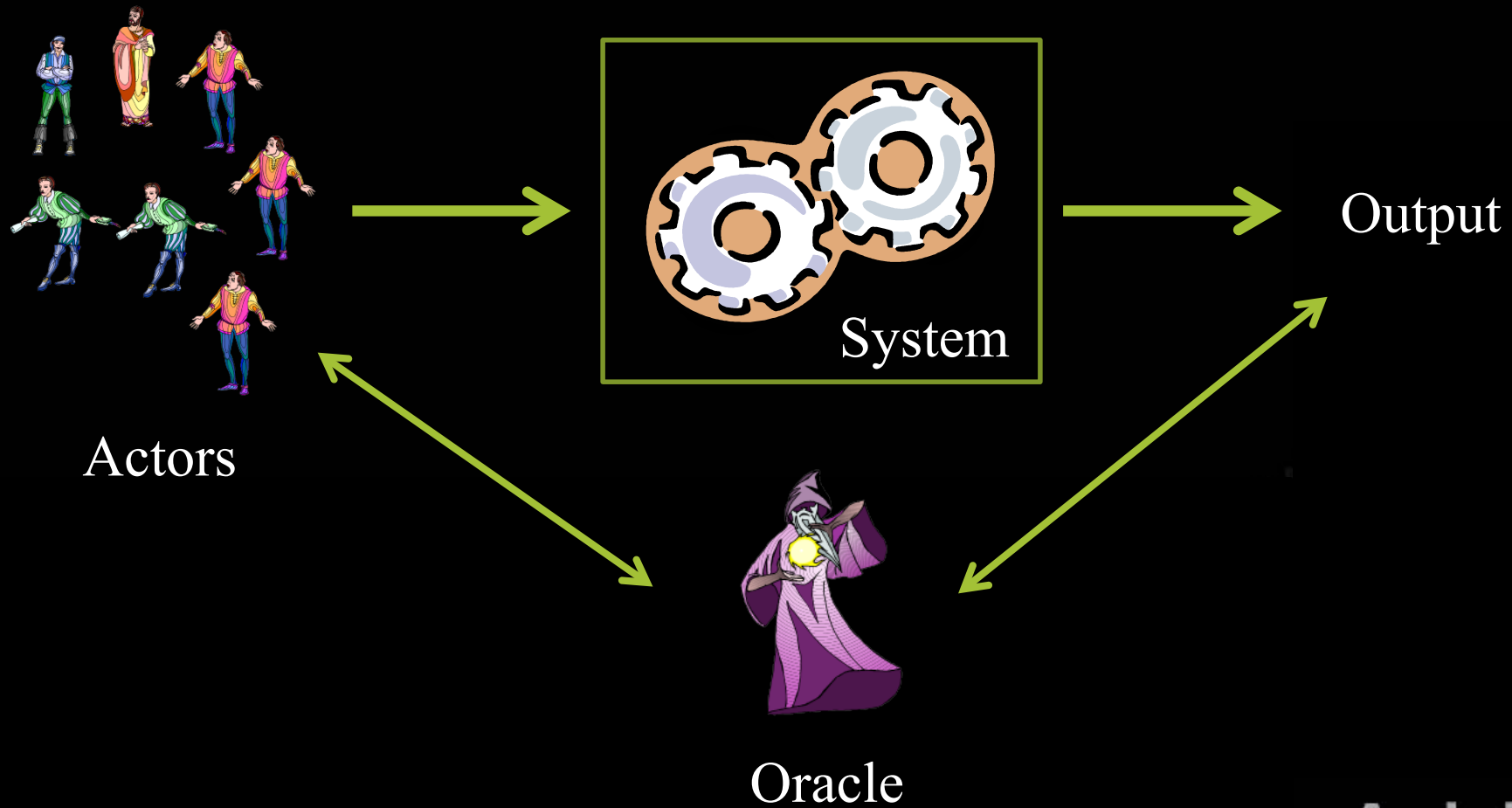
06-10 Cinnober FT

10- ... AddQ



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Automated Random Test



Simple Functional Test

EnterBuyOrder (Volume = 100, Price = 23)

EnterSellOrder (Volume = 100, Price = 22)

Trades[] myTrades = **GetAllTrades** ()

Assert(myTrades.Count == 1)

Assert (myTrades.First().Price = 23)

Assert (myTrades.First().Volume = 100)

Same but random

```
For (int i=0; i<1000; i++) // Lets do this 1000 times !!!
```

```
{
```

```
    priceBuy = Random(20,30) // Gives a random price 20-30
```

```
    EnterBuyOrder (Volume = 100, Price = priceBuy)
```

```
    priceSell = Random(20,30) // Gives a random price 20-30
```

```
    EnterSellOrder (Volume = 100, Price = priceSell)
```

```
}
```

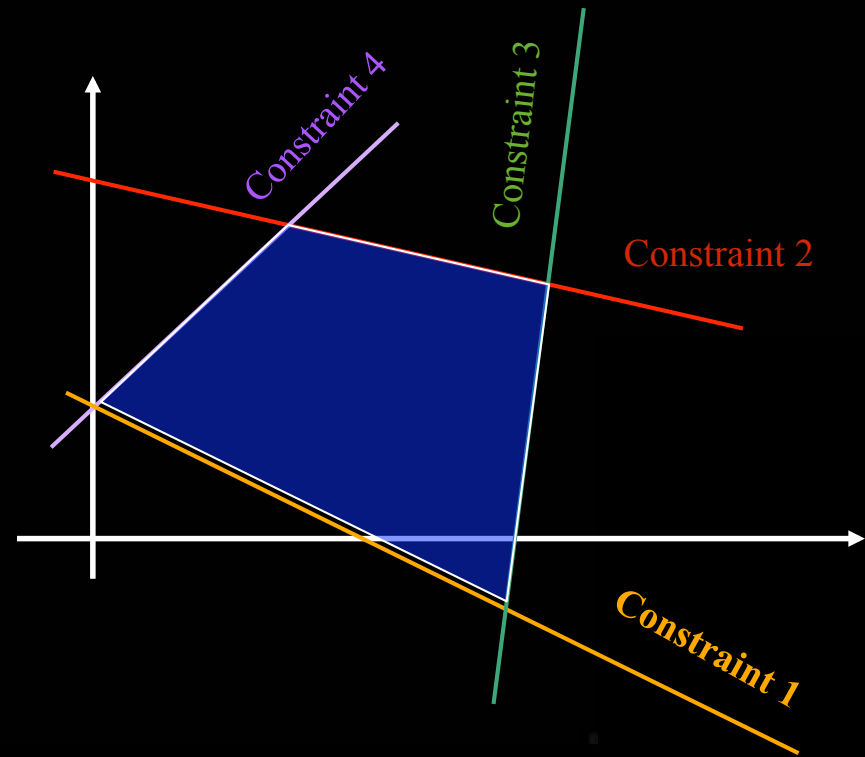
```
Trades[ ] myTrades = GetAllTrades ()
```

```
Assert.IsTrue (myTrades.All ( t => t.Price < 30))
```

```
Assert.IsTrue (myTrades.All ( t => t.Price > 20))
```

Oracle Design

- Very Simple (e.g. system crash)
- Something in the middle
- Exact copy of the system



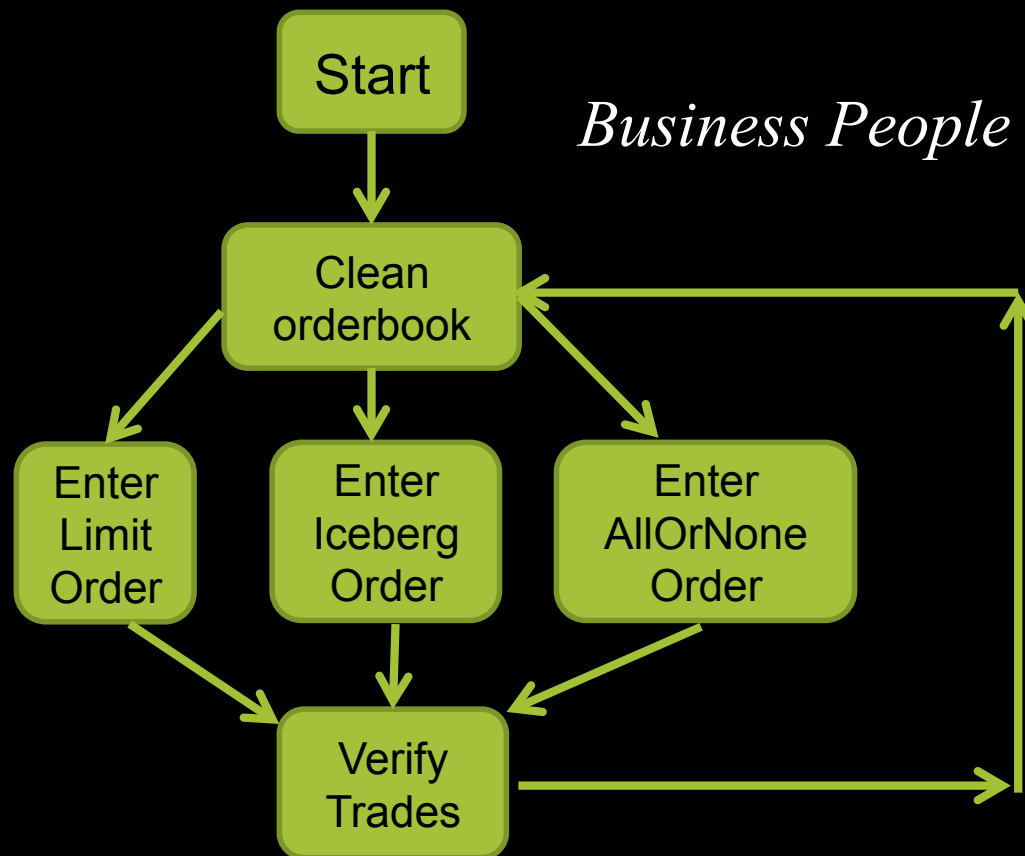
Google on “Hoffman Random Tests”

Master Thesis “Random Tests in a Market Place System”
Johan Gundemark, 2005

Master Thesis “Random Tests in a Trading System”
Noah Höjeberg, 2008

Oracle Design MBT

- Finite State Machines (FSM) can be used as models



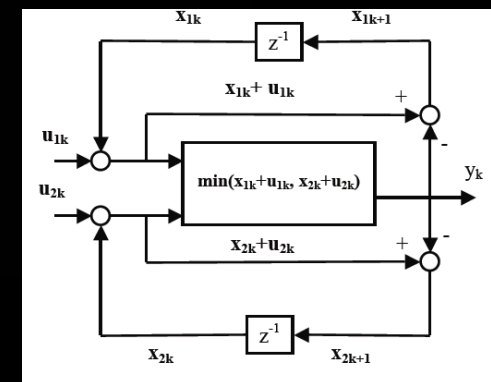
Business People can understand this!

Google on:

*Kristian Karl
Graphwalker*

Advanced Oracle Design

- Constraint Model Based Oracle
 - Master Thesis “Constraint Programming for Random Testing of a Trading System”
Roberto Castaneda Lozano, 2010
- Neural net based oracle
 - Master Thesis “Neuronnätsbaserad agent”
Torbjörn Bäckmark, 2001
- Machine learning based oracle
 - Master Thesis “Learning the transaction flow at an exchange”
Peter Stenman , 2002 (Alexander Kaul supervisor at OMX)



Random Test vs. Criticality

Technique	Phase	SIL 1	SIL 2	SIL 3	SIL 4
White Box Test	Unit	SR	SR	SR	SR
Black Box Test		R	R	SR	SR
Statistical Test		-	R	R	SR
White Box Test	Integration Test	R	R	R	SR
Black Box Test		SR	SR	SR	SR
Statistical Test		-	R	R	SR
Black Box Test	System Test	SR	SR	SR	SR
Statistical Test		R	R	SR	SR
Stress Test		R	R	R	SR

R = Recommended
SR = Strongly Recommended

Master Thesis “Tekniker för att testa mjukvara” (studie börssystem)
Stefan Sjärd, Dag Wester, 2001

Master Thesis ...

- An excellent way to do some R&D in Test
- A good way to recruit students
- A good way to help students into a career!

Not difficult to be a supervisor, the school supports a lot!

The Thesis can be found on various places on internet, but to make it easier for you:

<http://www.addq.se/seminarier/sast-randomtester/>