

Security Matching System Present

Shen Guanzhi

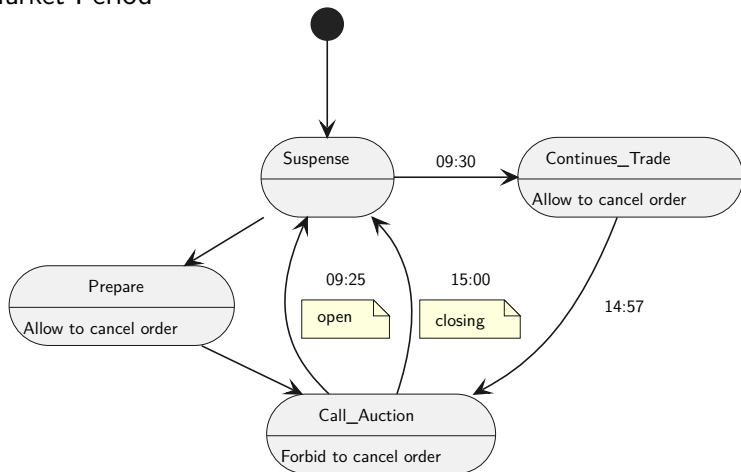
2024 年 11 月 24 日

Terms

- ▶ Buy 买（动词）
- ▶ Sell 卖（动词）
- ▶ **Bid** Order 买单
- ▶ **Offer** Order 卖单
- ▶ Cancel Order 撤单
- ▶ Quantity 数量
- ▶ Call Auction 集合竞价
- ▶ Continuous Trade 连续竞价
- ▶ Quotations 行情

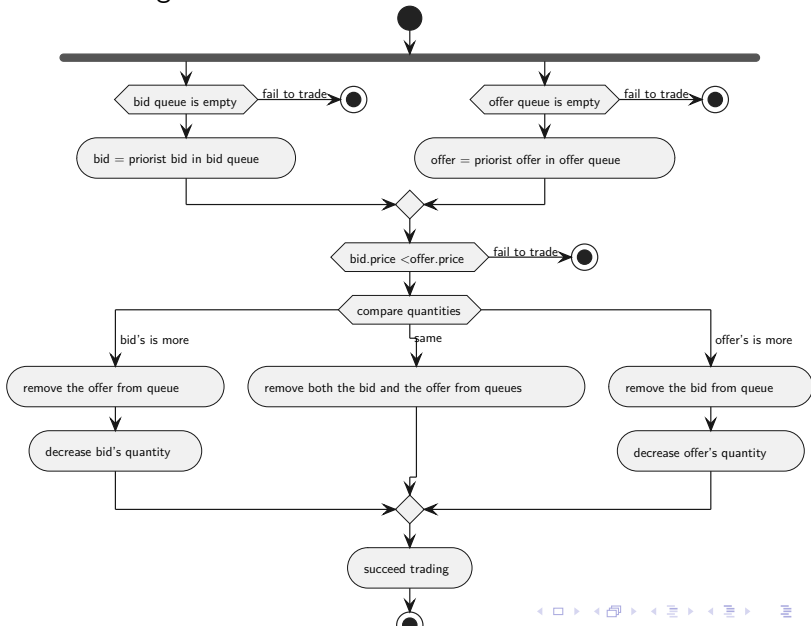
Question Analysis

Market Period



Question Analysis

Once Matching



Question Analysis

表: Call Auction vs Continues Trade

Similarity	Differences	
Repetition of Once Matching Process	Call Auction	CPU-Intensive
		Non-Preemptive
	Continues Trade	I/O-Intensive
		Preemptive

Program Design: Book

The book of a security consist of a bid queue and a offer queue.

	Get Peak	Pop Peak	Insert	Delete
Binary Heap	$O(1)$	$O(\log n)$	$O(\log n)$	$O(n)$
Balanced Tree	$O(\log n)$	$O(\log n)$	$O(\log n)$	$O(\log n)$

It is not frequent to only get the peak value but not pop it. And delete value is also important. By use a balanced tree, quotations gotten by user are ordered.

Program Design: Deal Maker

Each security has its own deal maker.

- ▶ Book
- ▶ Waiting Queue: Bids and offers which has been recorded to database but has not join the book.
- ▶ Watcher
- ▶ Auction Task: A coroutine trying to pop orders from the Waiting Queue and trade them or push them into the book.

Program Design: Deal Maker

There are some different coroutines wanting to read and write a deal maker, which is the main challenge of the whole system.

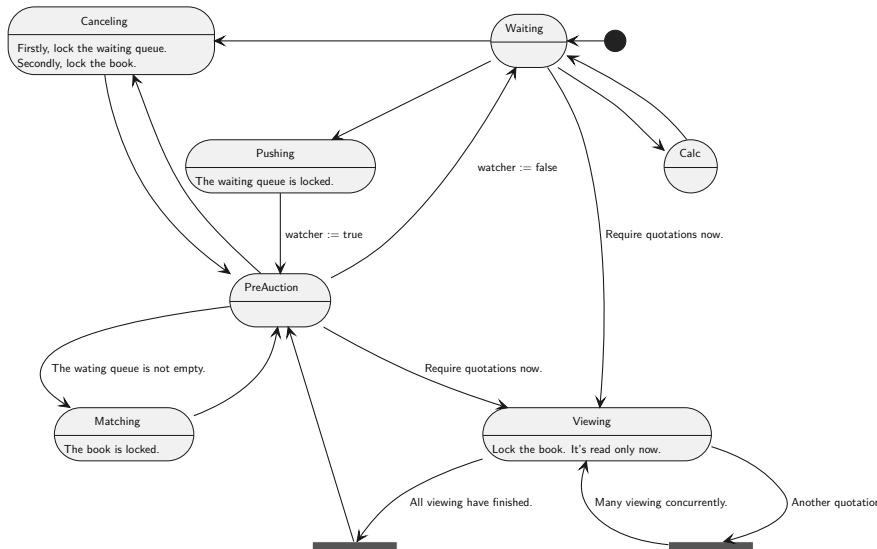
- ▶ Accept Task: Push an order into the waiting queue, and then suspense the calculate task and wake up the auction task.
- ▶ Auction Task: Pop orders from the waiting queue. While no waiting order, it should wake up the calculate task and suspend.
- ▶ Cancel Task: Try to remove order from the waiting queue. (Binary search. $O(\log n)$) If failing, then remove order from the book.
- ▶ Task which calculate opening or closing price: should wait for the waiting queue empty.
- ▶ View Task: Get the quotations at the present time.

Program Design: Deal Maker

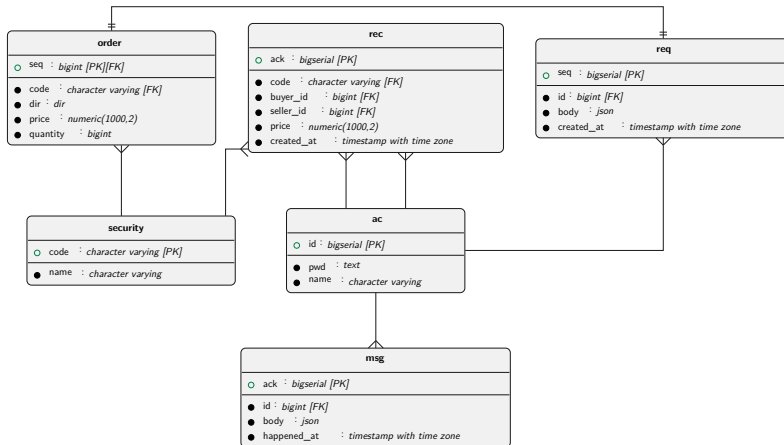
The synchronizing algorithm should be both correct and fair.

- ▶ Both the book and the waiting queue are protected with R/W lock.
- ▶ The watcher is a special channel provided by the coroutine runtime.

Program Design: Deal Maker



Database Design



- ▶ While order and msg tables are used to backup data in memory, req and res tables are used to save user order requirement and trade record.
- ▶ Transaction is utilized.