graduate housing, assignments information talk

WELL, IT'S BEEN A THRILL LISTENING TO YOU TALK ABOUT OPERATING SYSTEM SOURCE CODE, JASON, BUT I'VE HIT MY LIMIT.

I'VE ONLY BEEN TALKING ABOUT IT FOR FIVE MINUTES.

WELL, THAT'S MY LIMIT. MAYBE WE CAN RESUME THIS DISCUSSION TOMORROW, THEN?

I MEAN, THAT'S MY LIMIT FOR MY LIFETIME. I LET YOU TALK ABOUT SWIMSUIT MODELS!

march, 2004
Anthony Gray, MIT Housing
Graduate Housing Assignments

Information: who, where, what, when, and why
overview

♦ Who Enters
  * Who are New and Continuing students?
  * Single or Family?

♦ How it works
  * Not a lottery, but an allocation
  * Being thoughtful → Collaborative Optimization
  * What’s up with the $250 fine?

♦ What are my chances?
  * New/Continuing, single/family: 2003 Statistics

♦ What to expect
  * Web tour

♦ Questions
part one:
who enters
overview

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who enters?

* New students enter the New Student Allocation
* Continuing Students enter the Continuing Student Allocation
* New Students:
  * Are entirely new to MIT; they have never been registered or cross registered at MIT before, even as an undergraduate
* Continuing Students:
  * Graduate students who are not New Students are Continuing
* What is Continuing Student status?
  * A student assigned to a spot through the Continuing Student Allocation has Continuing Student Status and does not need to enter the Allocation again – she may stay until she graduates
family

* Families are couples in committed long-term full time relationships
  * proof of family will be required
* Full Time means that your partner lives with you every day
* Dependents (with documentation) are okay
* Families with children are not eligible for Westgate efficiencies
* Families without children are not eligible for 2 bedroom apartments
what to do

* Students with Continuing Status should renew their housing (if they want to stay):
  * [http://web.mit.edu/housing/grad/]

* Students without Continuing status should first terminate their housing...
  * [http://web.mit.edu/housing/grad/]

* ... and then enter the Continuing Student Allocation
when?

- The New and Continuing Allocations will open on March 1, 2004
- The Renew and Terminate pages will also open on March 1, 2004
- The New and Continuing Allocations will close on May 21, 2004
- Results of the Allocation will be available by email on May 28, 2004
- You may enter and withdraw, or change your preferences as many times as you like between March 1, and May 21
- But after May 21...
part two:
how it works
overview

✶ Who Enters
  ✶ Who are New and Continuing students?
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  ✶ What’s up with the $250 fine?

✶ What are my chances?
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✶ What to expect
  ✶ Web tour

✶ Questions
not a lottery

- There are no lottery numbers
- Instead, your assignment is determined by your preferences
- Aim is to maximize the number of students who get housing (first) and to minimize the number of students who are assigned low preferences (second)
- Why do it this way?
lottery vs better

Super simplification

old lottery

1_{A,B} → A
2_A → B

new allocation

1_{A,B} → A
2_A → B
lottery vs better

Another super simplification

old lottery

new allocation
## algorithm comparison

- **2 years ago:**
  - lottery style, greedy algorithm, individual optimizing

- **this year:**
  - preference based, min cost flow, system optimizing

<table>
<thead>
<tr>
<th></th>
<th>last year</th>
<th>2 years ago</th>
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<tbody>
<tr>
<td>first</td>
<td>463</td>
<td>510</td>
</tr>
<tr>
<td>second</td>
<td>264</td>
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<td>fourth</td>
<td>32</td>
<td>43</td>
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<tr>
<td>fifth</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>sixth</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>&gt; sixth</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>average</td>
<td>1.6</td>
<td>1.7</td>
</tr>
<tr>
<td>unassigned</td>
<td>98</td>
<td>137</td>
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<tr>
<td>vacancies</td>
<td>90</td>
<td>&gt;150</td>
</tr>
</tbody>
</table>
what is collaborative optimization?

- information transparency
  - algorithmic style? supply? demand?
- continuous information sharing
  - modification and feedback
  - seeking equilibrium
  - analogous to a *bidding* phase

in practice:
- open the assignments (allocation) process early
- publish and update supply and demand data as it evolves
- allow students to revise preferences accordingly (withdraw, reenter without penalty) until the deadline
initial position:

graduate demand
initial position:

- Ashdown double
- Tang 3
- Tang 4
- Warehouse
- Tang 2
- SP eff.
- Eastgate eff.
- Edgerton 2
- Eastgate corner
- Edgerton 3
- Westgate 2
- Westgate 1
- Edgerton 1
- SP eff.
- Green single
- Green double
- Eastgate 2
- Eastgate 1
- Edgerton eff.

Capacity

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Single Normalized Demand

1st choice | 2nd choice | 3rd choice | 4th choice | 5th choice | 6th choice | 7th choice
--- | --- | --- | --- | --- | --- | ---
S&P Quad | 1.1 | 0.5 | 7.0 | 3.8 | 0.5 | 1.9 | 2.3 | 0.8 | 2.1 | 0.6 | 7.5 | 12.0 | 25.0
Asc. Double | 1.8 | 0.8 | 5.0 | 4.5 | 0.3 | 3.9 | 2.3 | 2.3 | 2.9 | 0.7 | 10.5 | 14.0 | 30.0
Asc. Corner Double | 1.6 | 1.0 | 6.0 | 5.0 | 0.9 | 5.8 | 3.0 | 3.0 | 3.3 | 0.5 | 12.5 | 12.5 | 34.0
Edgerton 2 beds | 1.6 | 0.6 | 4.0 | 8.3 | 1.7 | 8.3 | 7.3 | 3.9 | 10.3 | 1.7 | 23.5 | 23.5 | 25.0
Green Single | 1.6 | 0.6 | 4.0 | 8.3 | 1.7 | 8.3 | 7.3 | 3.9 | 10.3 | 1.7 | 23.5 | 23.5 | 25.0
Edgerton 3 beds | 2.9 | 1.9 | 1.0 | 7.8 | 1.5 | 18.4 | 3.7 | 6.9 | 9.3 | 2.5 | 21.5 | 27.0 | 62.0
S&P efficiency | 1.8 | 0.4 | 12.0 | 10.8 | 5.3 | 10.0 | 6.0 | 4.8 | 11.8 | 6.6 | 20.0 | 38.5 | 67.0
Edgerton 1 bed | 1.5 | 1.6 | 2.0 | 4.0 | 6.4 | 6.8 | 7.7 | 9.9 | 10.3 | 15.5 | 18.5 | 38.5 | 45.0
Edgerton 4 beds | 1.5 | 1.6 | 2.0 | 4.0 | 6.4 | 6.8 | 7.7 | 9.9 | 10.3 | 15.5 | 18.5 | 38.5 | 45.0
Edgerton Efficiency | 1.5 | 1.6 | 2.0 | 4.0 | 6.4 | 6.8 | 7.7 | 9.9 | 10.3 | 15.5 | 18.5 | 38.5 | 45.0
how does this help?

students | preferences | rooms
---|---|---
tony | a e d b c | c e d b a | room a
jason | a b | a b | room b
denise | d b a e c | d b a c | room c
isabel | a b c d | a b c d | room d
jim | a b | e d c a b | room e
potential problem

* How do we enforce the idea that preferences determine assignments?
  * if someone can indicate whatever preferences they like, only to decline an assignment they didn’t want, then they will be forcing someone off campus who otherwise wouldn’t have had to go

* How do we ensure the integrity of the bidding phase?
  * if someone can indicate whatever preferences they like, only to decline an assignment they didn’t want, then they will have invalidated the bidding process forcing unnecessary compromises and calibrations on other students

* What to do?
The ugly $250

* There is a $250 fine for not accepting your assignment, or withdrawing from the allocation between May 21 and May 28
  * between March 1 and May 21 you can change your preferences, withdraw and re-enter as many time as you like, penalty free

* The aim is to dissuade casual or frivolous entries...

* ... and thereby to improve both *fairness* and *efficiency*
improved efficiency

* last year, 85 students declined, or did not respond to their first round assignment
  * most were fined $250

* two years ago, 878 students declined, or did not respond to their first round assignment
second round

* What happens to any remaining vacancies?
  * late cancellations, declined rooms...

* Second Round of the Allocation

* We ask all of those who did not receive an assignment if they would like to be considered in another iteration of the process
  * no penalty for declining the invitation
  * same rules, same general procedure
part three:
what are my chances?
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good question

- Difficult to gauge
  - terminations and renewals differ from year to year
    - graduation, enrollment, external factors

- What you can do:
  - indicate preferences for as many places as you feel comfortable living in
    - increases your chances in the obvious way
    - weighted to favour students with a greater number of preferences
  - calibrate
## the big picture, 2003

<table>
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<th>status</th>
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<th>applications</th>
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<td>859</td>
<td>≈ 800</td>
<td>699</td>
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<tr>
<td>continuing</td>
<td>single</td>
<td>136</td>
<td>≈ 840</td>
<td>206</td>
</tr>
<tr>
<td></td>
<td>family</td>
<td>29</td>
<td>≈ 280</td>
<td>29</td>
</tr>
</tbody>
</table>
big picture notes

* unassigned new students had limited preferences (most wanted *only* the Warehouse)
* we tried to accommodate male/female ratios
* we made some changes on the fly
  * New SP 2 Beds: changed the male/female distribution (+30 men, from 95/81 to 120/50)
  * New Tang 4 Beds: changed the male/female distribution (-28 men, from 133/32 to 105/60)
    ✗ didn’t matter
  * Ashdown: changed the new/continuing ratio (from 129/61 to 51/120)
part four:

what to expect, questions
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