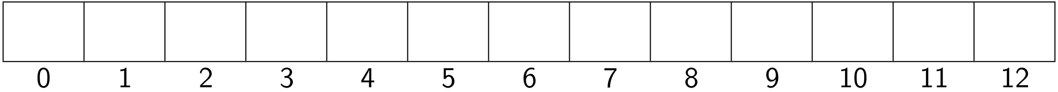
Chapter 6, Hash tables:

- General introduction; separate chaining (last week Friday)
- Open addressing (**Today**)
- Hash table performance (Monday after Thanksgiving)

Today:

- Review/finish hash table concepts
- Basic idea and example of open addressing
- Terminology, code, and invariant
- Probing strategies
- Deletion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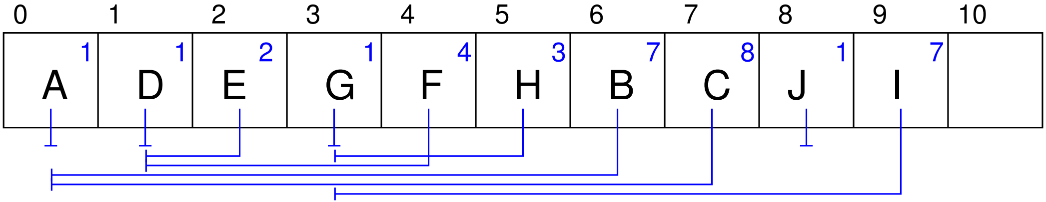
Invariant (Class `OpenAddressingHashMap`)

1. *The table it not full; there exists* $i \in [0, m)$ *such that* $\texttt{table}[i] = \texttt{null}$.
2. *There are no breaks in the chain for any key in the table; for all* $i \in [0, m)$ *such that* $\texttt{table}[i]$ *contains key* k,
   - *if* $h(k) \leq i$, *then for all* $j \in [h(k), i], \texttt{table}[j] \neq \texttt{null}$;
   - *if* $i < h(k)$, *then for all* $j \in [0, i] \cup [h(k), m), \texttt{table}[j] \neq \texttt{null}$.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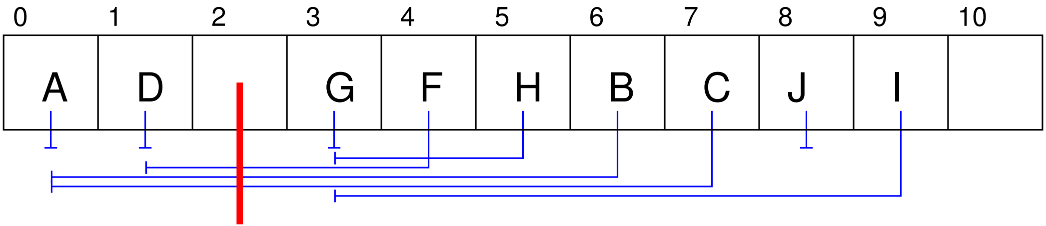
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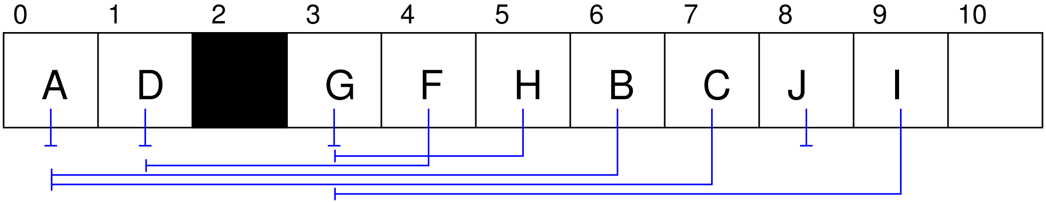
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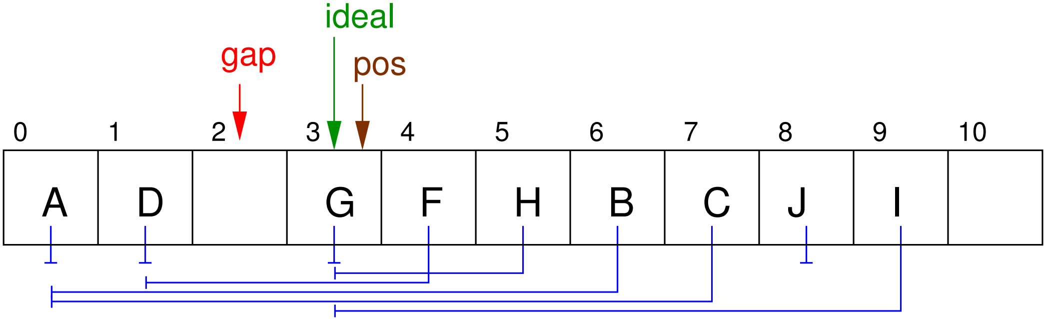
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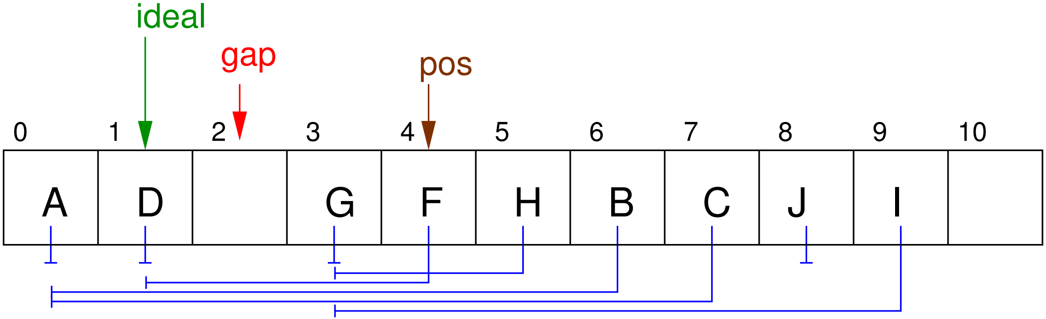
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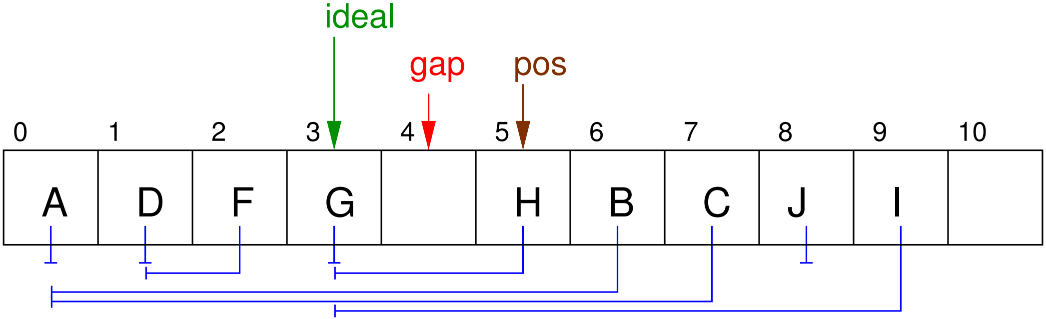

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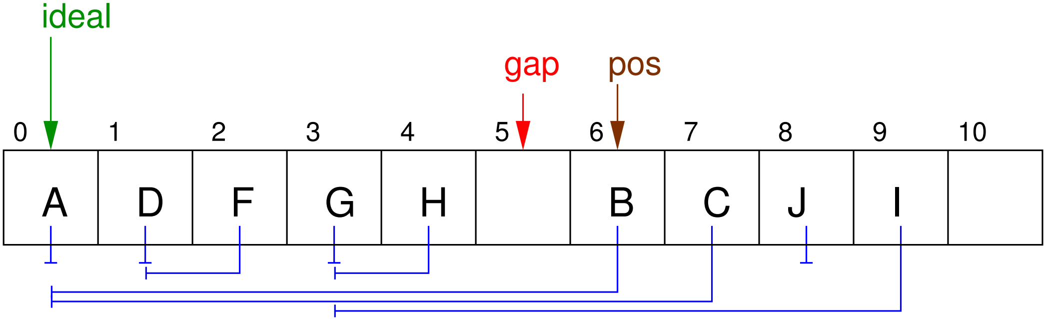
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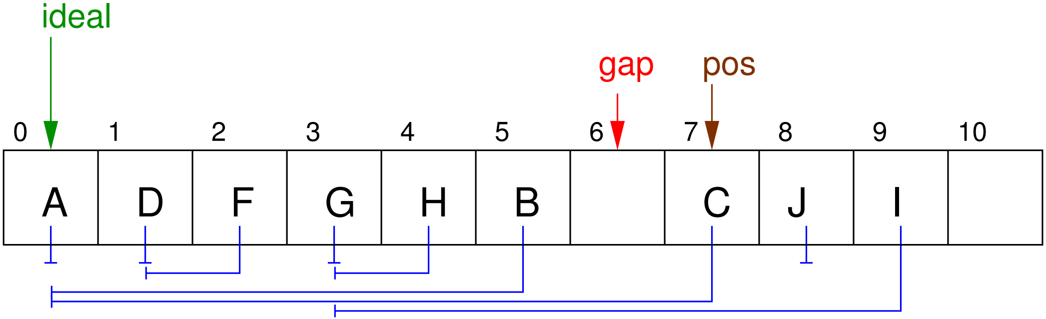
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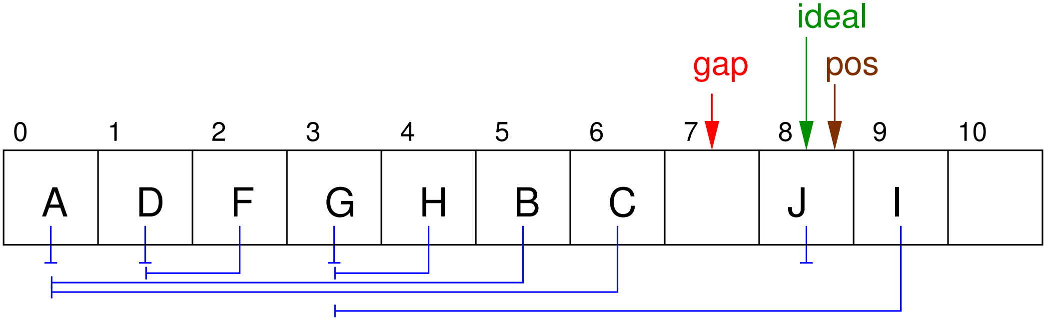
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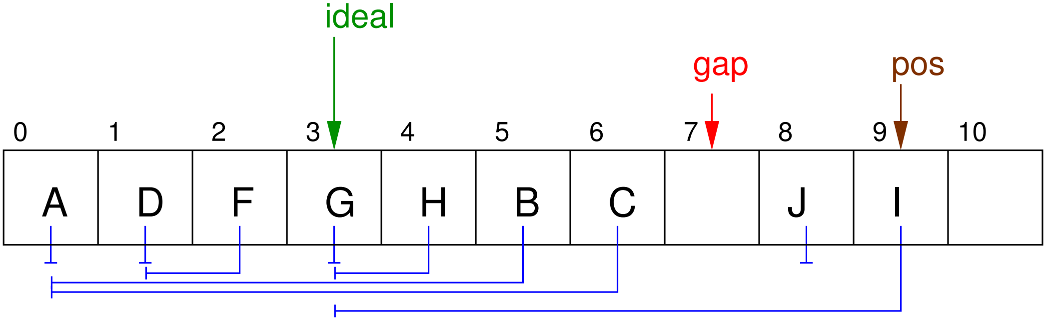
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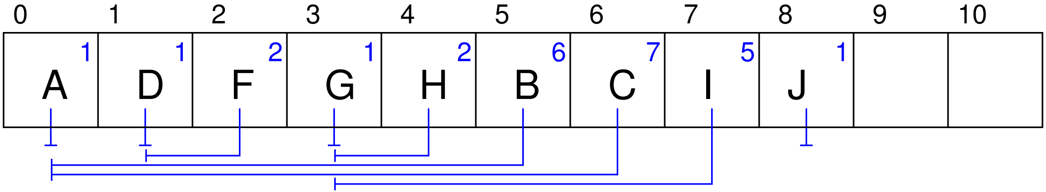
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G 1
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C 7
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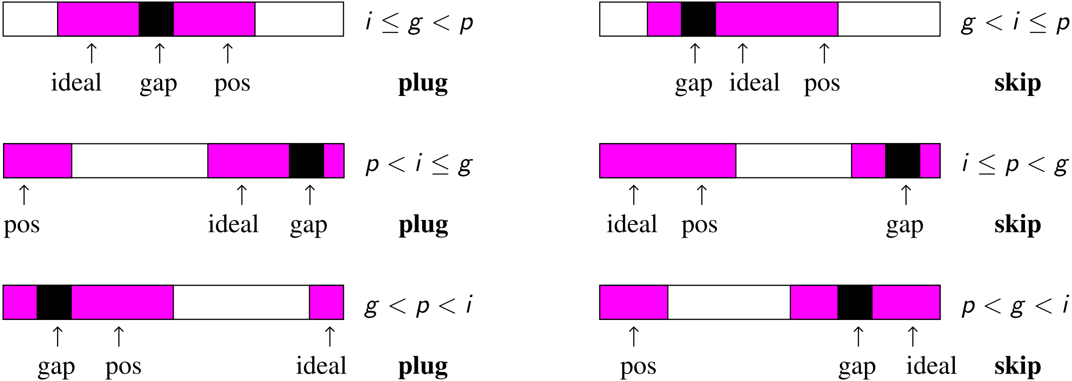

Invariant (Loop of optimized remove in linear probing.)

For all positions $k \in (i, j)$, gap is the only position, if any, between its ideal place ($h(\texttt{keys}[k])$) and its actual place (k).

Coming up:

Do **Optimal BST** *project (suggested by Today, Nov 21)*

Due **today, Mon, Nov 21** *(end of day)*
Do Project 7.1 (as practice problem)

Due **Mon, Nov 28** *(end of day) (recommended to be done before break)*
Read Section 7.3
Do Exercises 7.(4,5,7,8)
Take quiz