CSE 414

SECTION 4 – RELATIONAL ALGEBRA
Why RA?

- Formalism for describing queries
- Basis of relational databases
- Will make you a SQL wizard!
Notes on RA

- Multiple possible query plans

- Logical vs. Physical query plans

A physical query plan is a logical query plan annotated with physical implementation details.
Example: RA-to-SQL

Person(id, name, countryid)
Country(id, name, continent)

SELECT C.id
FROM Person P, Country C
WHERE P.countryid = C.id
AND C.continent='Africa'
GROUP BY C.id
HAVING COUNT(*) > 10000000

Can we make a more efficient plan?

Equivalently in equation form: \( \Pi_{C.id}(\sigma_{\text{pop}>10,000,000}(\gamma_{C.id,\text{COUNT}(\cdot)}\rightarrow \text{pop}(\sigma_{\text{C.continent}=\text{Africa}}(\text{Person } P \bowtie_{P\text{.countryid}=C.id} \text{ Country } C)))) \)
## RA Reference Sheet

<table>
<thead>
<tr>
<th>Name</th>
<th>Symbol</th>
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</thead>
<tbody>
<tr>
<td>Selection</td>
<td>$\sigma$</td>
</tr>
<tr>
<td>Projection</td>
<td>$\pi$</td>
</tr>
<tr>
<td>Join</td>
<td>$\Join$</td>
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<tr>
<td>Group By</td>
<td>$\gamma$</td>
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<tr>
<td>Set Difference</td>
<td>$\setminus$</td>
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<tr>
<td>Duplicate Elimination</td>
<td>$\delta$</td>
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