MapReduce Operator Implementations

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1 Aggregation without group-by

- **map**:
  - (name, salary) -> $\{(1, \text{salary})\}$
- **reduce**:
  - input: $(1, [\text{salary}_1, \ldots, \text{salary}_n]) ->$
  - output: $\{(1, \text{sum}(\text{salary}_1, \ldots, \text{salary}_n))\}$

2 Aggregation with group-by

$\gamma_{G;f(a)}(R)$
$\quad \gamma_{;sum(a)}(R)$

- **map**:
  - (name, (salary,dept)) -> $\{(1, \text{salary})\}$
- **reduce**:
  - input: $(1, [\text{salary}_1, \ldots, \text{salary}_n]) ->$
  - input: $\{(1, \text{sum}(\text{salary}_1, \ldots, \text{salary}_n))\}$