Given a list of n people P, a year y_s and a year y_l s.t:

1. $|y_s - y_l| < c$ for some known constant c.

2. $y_l < 2 * y_s$.

3. for each people p in P you're given $p's$ year of birth $birthYear_p$ and $p's$ year of death $deathYear_p$.

4.$\forall p(p \in P \rightarrow y_s \leq birthYear_p \leq deathYear_p \leq y_l)$.

find the year that most of the people lived in.

Solution's idea:

We have an upper limit for $y_l - y_s$ so we construct an array of integers $yearsCount$, of size

$y_l - y_s + 1 \in O(1)$.

Each index i of the array have a one-to-one mapping to a year in $\{y_s, y_s + 1, \dots, y_l\}$, given by $y_s + i$.

Or, given the year y , we can get the corresponding index by $y - y_s$.

An element of the array $yearCount$ is a counter that counts the number of instances of a year, depends on the data fetched from P.

After the last update of $yearCount$ is complete, we only need to find the index r that contains the largest integer and return the result y_s + r to get the most common year.

The algorithm goes as follows:

$Given\ P, y_s, y_l$.

1. $do\ yearsCount[y_l - y_s + 1] \leftarrow \{ 0 \}$.

2. $for\ each\ p \in P$ do:

    2.1. $leftIndex \leftarrow birthYear_p - y_s$.

    2.2. $rightIndex \leftarrow deathYear_p - y_s$.

    2.3. $for\ i \leftarrow leftIndext\ to\ rightIndex\ do$:

        2.3.1. $yearsCount \leftarrow yearsCount + 1$.

3. $return\ y_s + indexOf(\max(yearsCount[0 \dots y_l - y_s]))$.

$$Space\ Complexity: O(1), Time\ Complexity: O(|P|) = O(n)$$