Parameter Estimation For A Logistic Curve. An Example of Use in an Engineering Problem

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When you try to solve some engineering problems such as the water supply for a city or to calculate the traffic in a road, many times you will be led to make an estimation of the future population which is going to live in the city or cities that the road connects. In this situation, the most usually way to estimate the population is using a logistic curve like:

$$P = \frac{S}{1 + Me^{bt}} \tag{1}$$

where S, M and b are parameters that could be calculated like:

- $S = \frac{2P_0P_1P_2 - P_1^2(P_0+P_2)}{P_0P_2 - P_1^2}$,
- $M = \frac{S-P_0}{P_0}$,
- $b = \frac{1}{n}[\frac{P_0(S-P_1)}{P_1(S-P_0)}]$ and
- $n = (t_2 - t_1) = (t_1 - t_0)$.

taking P_0, P_1 and P_2 (populations) in equidistant times t_0, t_1 and t_2.
This way, the parameter estimation is done tanking into account only 3 populations equidistantly taken in time, and you could not take another set of data. If you want to take some others data, you should do the resolution into another way, and we propose to tackle this issue with genetic algorithms.
We have obtained some reasonable results with this approach, that represents an alternative to the classical way of estimating parameters in logistic curves.