

THE HISTORY OF THE CITY OF BOSTON

BY
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The history of the city of Boston is a story of growth and change. From its founding in 1630, it has evolved from a small settlement to a major center of commerce and industry. The city's location on a natural harbor provided a strategic advantage, and its residents have always been known for their entrepreneurial spirit. Over the centuries, Boston has been a crucible of ideas, a place where new movements and philosophies have often taken root. The city's rich cultural heritage is reflected in its numerous museums, theaters, and historical landmarks. Today, Boston continues to be a vibrant and dynamic city, embracing its past while looking towards the future.

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The first part of the paper is devoted to the study of the asymptotic behavior of the solutions of the system (1.1) as $t \rightarrow \infty$. It is shown that the solutions of the system (1.1) converge to a steady state as $t \rightarrow \infty$ if and only if the matrix A is positive definite. In this case, the steady state is unique and is given by the vector x^* which satisfies the equation $Ax^* = b$. If the matrix A is not positive definite, then the solutions of the system (1.1) do not converge to a steady state as $t \rightarrow \infty$. In this case, the solutions of the system (1.1) oscillate around a steady state.

2. THE CASE OF A POSITIVE DEFINITE MATRIX A

In this section, we study the asymptotic behavior of the solutions of the system (1.1) as $t \rightarrow \infty$ in the case where the matrix A is positive definite. It is shown that the solutions of the system (1.1) converge to a steady state as $t \rightarrow \infty$ if and only if the matrix A is positive definite. In this case, the steady state is unique and is given by the vector x^* which satisfies the equation $Ax^* = b$.

Let us assume that the matrix A is positive definite. Then the solutions of the system (1.1) converge to a steady state as $t \rightarrow \infty$. In this case, the steady state is unique and is given by the vector x^* which satisfies the equation $Ax^* = b$.

To prove this, we first show that the solutions of the system (1.1) are bounded. Let $x(t)$ be a solution of the system (1.1). Then we have

$$\dot{x}(t) = -Ax(t) + b.$$
 Integrating both sides of this equation from t_0 to t , we get

$$x(t) = e^{-A(t-t_0)}x(t_0) + \int_{t_0}^t e^{-A(t-s)}b ds.$$
 Since the matrix A is positive definite, the matrix $e^{-A(t-t_0)}$ is a contraction mapping. Therefore, the solutions of the system (1.1) are bounded.

Next, we show that the solutions of the system (1.1) converge to a steady state as $t \rightarrow \infty$. Let $x(t)$ be a solution of the system (1.1). Then we have

$$\dot{x}(t) = -Ax(t) + b.$$
 Let x^* be the steady state of the system (1.1). Then we have

$$Ax^* = b.$$
 Let $y(t) = x(t) - x^*$. Then we have

$$\dot{y}(t) = -Ay(t).$$
 Since the matrix A is positive definite, the matrix e^{-At} is a contraction mapping. Therefore, the solutions of the system (1.1) converge to a steady state as $t \rightarrow \infty$.

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