

## Matriks invers Moore-Penrose dan aplikasinya pada matriks laplacian = Moore-Penrose inverse on matrices and its application on laplacian matrices

Jamaludin Malik Ibrahim, author

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### Abstrak

Invers Moore-Penrose merupakan perumuman invers pada matriks bujur sangkar. Setiap matriks dengan entri bilangan kompleks memiliki invers Moore-Penrose dan invers Moore-Penrose dari suatu matriks adalah tunggal. Ketunggalan invers Moore-Penrose dapat digunakan sebagai pengganti invers pada matriks persegi maupun persegi panjang. Dalam skripsi ini, dibahas konstruksi invers Moore-Penrose melalui  $A^{-1}$ ,  $(A^2)^{-1}$ ,  $(A^3)^{-1}$ ,  $(A^4)^{-1}$ ,  $(A^5)^{-1}$ , dan  $(A^6)^{-1}$ . Kemudian, dibahas pula konstruksi invers Moore-Penrose dari matriks Laplacian dan beberapa sifat invers Moore-Penrose dari matriks Laplacian. Pada Teorema 4.4, invers Moore-Penrose dari matriks Laplacian memenuhi persamaan  $LL^\dagger = L^\dagger L = I + J$ , dengan  $J$  merupakan matriks berukuran  $n \times n$  yang setiap entrinya bernilai satu. Sehingga, invers Moore-Penrose dari matriks Laplacian dapat digunakan sebagai pengganti invers matriks Laplacian.

Moore-Penrose inverse is a generalized inverse from square matrices. Every matrix with complex entries has a unique Moore-Penrose inverse. Uniqueness of Moore-Penrose inverse can be used as a substitute inverse on square or rectangular matrices. In this skripsi, the construction of Moore-Penrose inverse is explain through  $A^{-1}$ ,  $(A^2)^{-1}$ ,  $(A^3)^{-1}$ ,  $(A^4)^{-1}$ ,  $(A^5)^{-1}$ , and  $(A^6)^{-1}$ . Moreover, the construction of Moore-Penrose inverse for Laplacian matrices, as well as some properties of the inverse, is also discussed. In Theorem 4.4, Moore-Penrose inverse satisfy the equation  $LL^\dagger = L^\dagger L = I + J$ , where  $J$  is an  $n \times n$  matrix with all entries are one. Moore-Penrose inverse is a generalized inverse from square matrices. Every matrix with complex entries has a unique Moore-Penrose inverse. Uniqueness of Moore-Penrose inverse can be used as a substitute inverse on square or rectangular matrices. In this skripsi, the construction of Moore-Penrose inverse is explain through  $A^{-1}$ ,  $(A^2)^{-1}$ ,  $(A^3)^{-1}$ ,  $(A^4)^{-1}$ ,  $(A^5)^{-1}$ , and  $(A^6)^{-1}$ . Moreover, the construction of Moore-Penrose inverse for Laplacian matrices, as well as some properties of the inverse, is also discussed. In Theorem 4.4, Moore-Penrose inverse satisfy the equation  $LL^\dagger = L^\dagger L = I + J$ , where  $J$  is an  $n \times n$  matrix with all entries are one.