

Er Ayu Nurafifah, 2018, **Analisis Model Matematika Orde Fraksional Penyebaran Worm Berbasis Wi-Fi Pada Smartphone**, Skripsi ini di bawah bimbingan Dr. Moh. Imam Utoyo, M.Si. dan Dr. Miswanto, M.Si. Departemen Matematika, Fakultas Sains dan Teknologi, Universitas Airlangga, Surabaya.

ABSTRAK

Worm merupakan suatu program atau *software* (perangkat lunak) yang memiliki kemampuan mereplikasi diri dan dapat menyebabkan kerusakan pada jaringan komputer. Pada umumnya *worm* menginfeksi jaringan komputer, namun seiring dengan perkembangan teknologi menyebabkan munculnya *worm* jenis baru yaitu *worm* berbasis *Wi-Fi* (*Wireless Fidelity*) yang dapat menginfeksi *smartphone*. Salah satu upaya penanggulangan *worm* adalah dengan menambahkan sebuah node baru pada jaringan *Wi-Fi* (*Wireless Fidelity*) yaitu node karantina untuk meminimalisir penyebaran *worm* pada *smartphone*. Model matematika penyebaran *worm* berbasis *Wi-Fi* (*Wireless Fidelity*) pada *smartphone* dapat digunakan untuk mengetahui dinamika penyebaran *worm*. Melalui dinamika penyebaran *worm*, dapat dipelajari faktor penghambat infeksi *worm*. Pada skripsi ini dilakukan analisis kestabilan titik setimbang model matematika orde fraksional penyebaran *worm* berbasis *Wi-Fi* (*Wireless Fidelity*) pada *smartphone* dengan orde turunan fraksional $\alpha \in (0,1]$. Berdasarkan analisis model, diperoleh dua titik setimbang yaitu titik setimbang bebas *worm* P_0 dan titik setimbang endemik P_1 . Titik setimbang bebas *worm* stabil asimtotis lokal jika $R_0 = \frac{\eta\beta N}{(\eta+\varepsilon+\mu)(\mu+\xi+\gamma)} < 1$, sedangkan titik setimbang endemik stabil asimtotis lokal jika $R_0 = \frac{\eta\beta N}{(\eta+\varepsilon+\mu)(\mu+\xi+\gamma)} > 1$. Kemudian dilakukan analisis sensitivitas dan simulasi numerik dengan variasi nilai orde fraksional α untuk mengetahui dinamika penyebaran *worm* berbasis *Wi-Fi* pada *smartphone*. Berdasarkan hasil simulasi numerik diperoleh hasil bahwa penambahan node karantina pada jaringan *Wi-Fi* (*Wireless Fidelity*) dapat menurunkan populasi node terinfeksi dan meningkatkan populasi node yang pulih.

Kata Kunci : *Worm*, *Worm* Berbasis *Wi-Fi* (*Wireless Fidelity*), Model Matematika Orde Fraksional, Titik Setimbang, Kestabilan.

Er Ayu Nurafifah, 2018, **Fractional Model Analysis of The Spread of Wi-Fi Based Worm in Smartphone**. This final project is under advised by Dr. Moh. Imam Utoyo, M.Si. dan Dr. Miswanto, M.Si. Department of Mathematics, Faculty of Science and Technology, Airlangga University, Surabaya.

ABSTRACT

Worm is a program or software that has the ability to self-replicate and can cause damage to computer networks. Worm is a program or software that has the ability to self-replicate and can cause damage to computer network. Generally, worm infects computer network, but along with development of technology causing the emergence of new worm that is a Wi-Fi (Wireless Fidelity) based worm that can infect smartphone. One of the worm's prevention effort is by adding a new node to the Wi-Fi (Wireless Fidelity) network that is the quarantine node to minimize the spread of worm on smartphone. Mathematical models of Wi-Fi (Wireless Fidelity) based worm deployment can be used to determine the dynamics of the spread of Wi-Fi (Wireless Fidelity) based worm in smartphone. Through the dynamics of the spread of worm, can be studied inhibiting factor of worm infection. In this thesis, we present a fractional model of the spread of Wi-Fi (Wireless Fidelity) based worm in smartphone with the fractional order derivative $\alpha \in (0,1]$. We determine the stability of fractional model equilibriums. Based on the model analysis, we obtained two equilibriums, namely free-worm equilibrium P_0 and endemic equilibrium P_1 . The free-worm P_0 is locally asymptotically stable if $R_0 = \frac{\eta\beta N}{(\eta+\varepsilon+\mu)(\mu+\xi+\gamma)} < 1$, while the equilibrium P_1 is locally asymptotically stable if $R_0 = \frac{\eta\beta N}{(\eta+\varepsilon+\mu)(\mu+\xi+\gamma)} > 1$. We also analyze the sensitivity of parameters to determine the most influence parameter to the spread of Wi-Fi (Wireless Fidelity) based worm. Furthermore, we perform numerical simulations with variations of α to illustrate the dynamical of the spread of Wi-Fi (Wireless Fidelity) based worm in smartphone. Based on the numerical simulations, we obtained that addition of quarantine node in Wi-Fi (Wireless Fidelity) network can decrease the population of infected nodes and increase the population of recovered nodes.

Keywords: *Worm, Wi-Fi (Wireless Fidelity) Based Worm, Fractional Mathematical Model, Equilibriums, Stability.*