A Comparison of Greedy and Most Forward Routing Protocol on FANET for Fire-Fighting

Muhammad Alfian Nugraha[1)], Sri Chusri Haryanti[2)], Heri Yugaswara[3)]
[1] muhammad.alfian@students.yarsi.ac.id, [2] sri.chusri@yarsi.ac.id, [3] heri.yugaswara@yarsi.ac.id,
Informatics Department, Faculty of Information Technology, Universitas YARSI

Motivation

In Indonesia, eleven provinces are vulnerable to forest and plantation fires. The firefighting process faces many challenges as the condition and extensive area of the disaster. Flying ad-hoc network (FANET) is a promising solution for rescue teams in turning off the flame or evacuating victims. In this research, we simulate and compare the performances of FANET using greedy and most forward routing (MFR) protocol to get more suitable routing protocol applied in the environment.

Environment

There occurs a forest/plantation fire. Rescue team employs FANET in overcoming the fire. Unmanned aerial vehicle (UAV) within FANET move in coordination within three-dimensional space

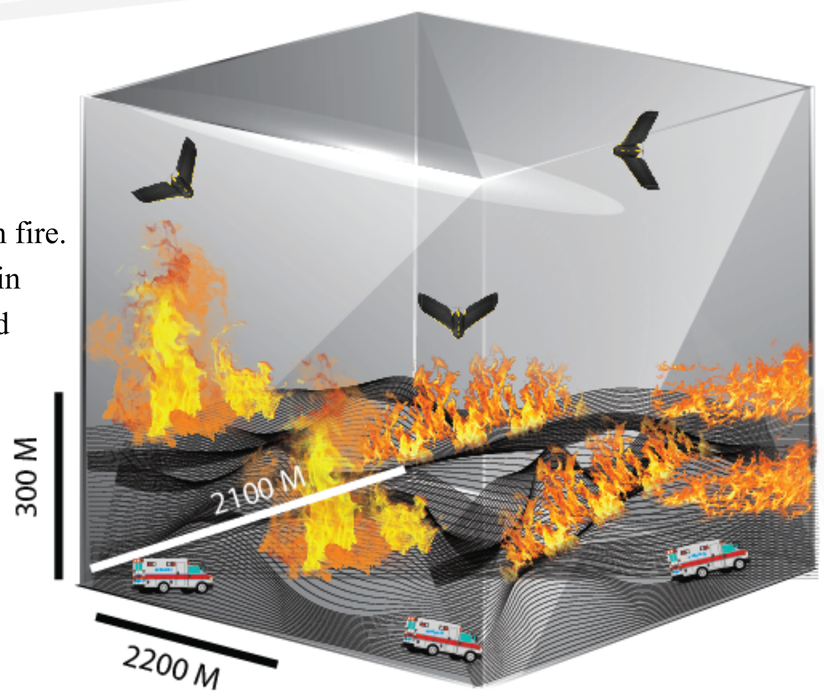

Figure 1. Illustration of FANET in the land fire area

Simulation

We conduct an NS2 simulation of forest/plantation fire-fighting using FANET. The movement of the nodes is manually generated. The nodes move in a coordinated fashion through four stages of movement, starting from covering area, scanning area, rescue, and rescue 2.

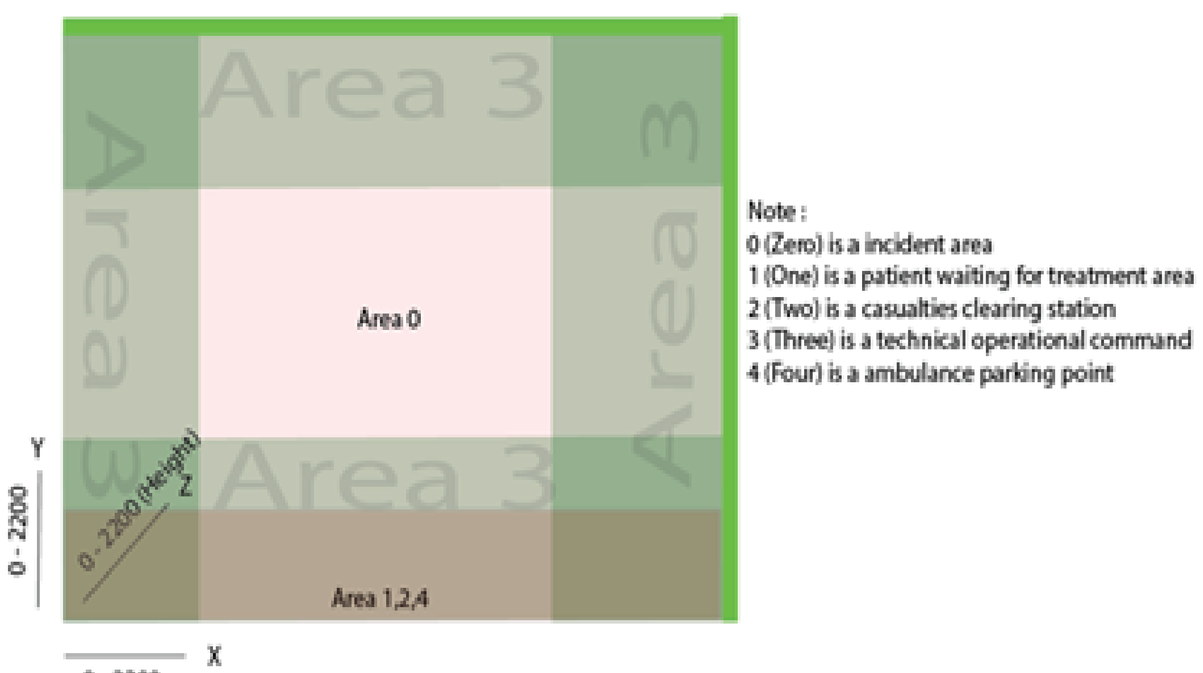

Figure 2. Partition of nodes movement in the area of the simulation

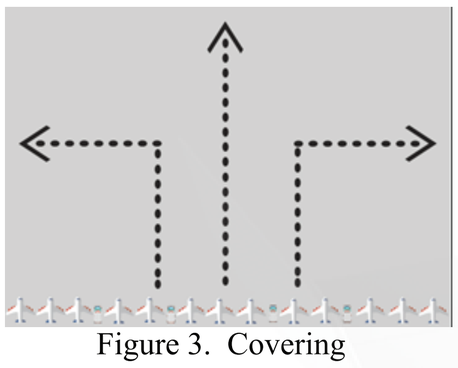

Figure 3. Covering

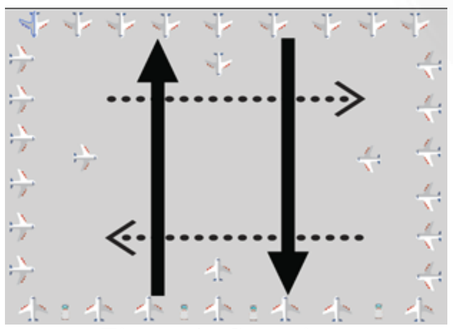

Figure 4. Scanning

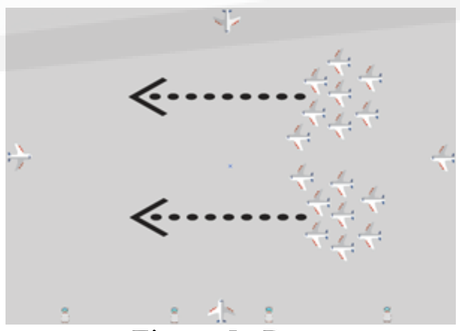

Figure 5. Rescue

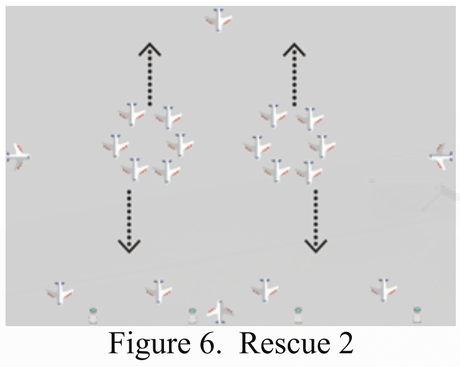

Figure 6. Rescue 2

Table 1. Simulation parameters

Parameter	Value
NS 2 simulator	2.35
MAC type	IEEE 802.11g
Propagation model	Freespace
Simulation area	2200 x 2100 x 300 m
Simulation environment	Plantation fires
Transmission range	200
Traffic type	CBR
Data packet size	512 bytes
Queue type	Drop tail
Simulation time	100 second
Number of nodes	48
Speed of nodes	100, 200, 300, 400 m/dt
Simulation protocol	GEO / position based
Node mobility	Disaster area model

Result

We examine end-to-end delay, throughput, packet delivery ratio, and routing overhead for different speed of the nodes. We compare performances of FANET using greedy and most forward routing (MFR) protocol.

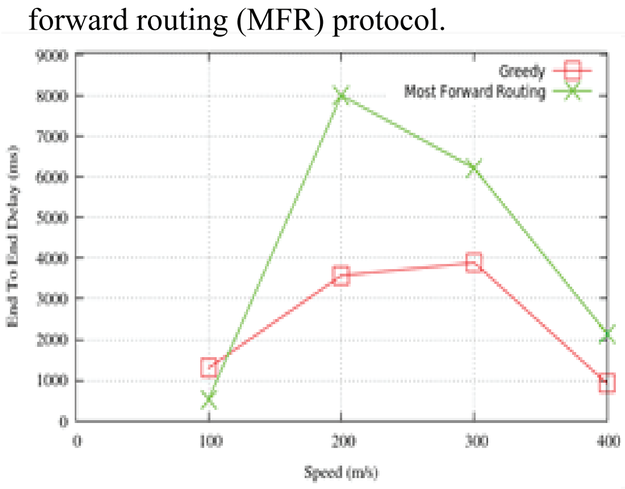

Figure 7. End to end delay

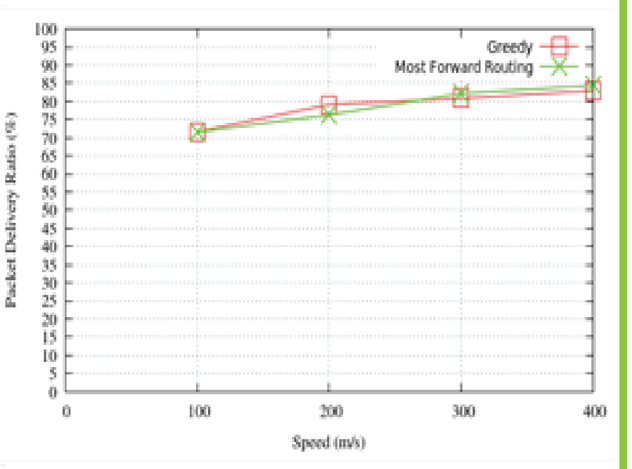

Figure 8. Packet delivery ratio

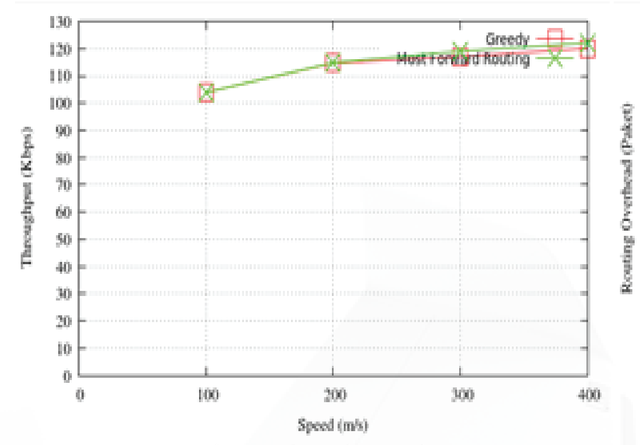

Figure 9. Throughput

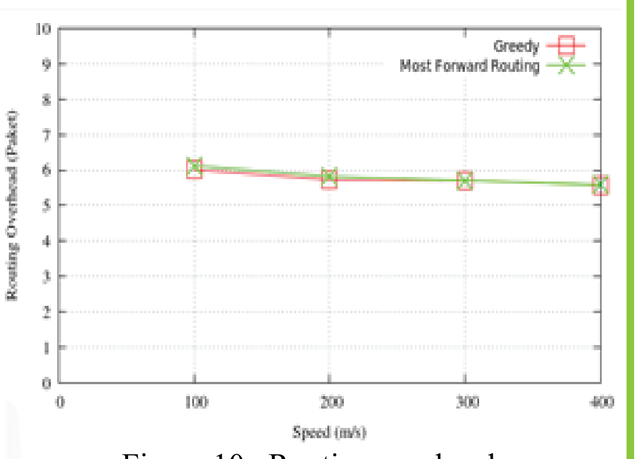

Figure 10. Routing overhead

Conclusion

Based on the simulation results, we recommend greedy routing protocol for FANET on Fire-Fighting, as Greedy provides a lesser end to end delay, while other performance parameters are approximately comparable to MFR.

Reference

- A. Bujari, C. E. Palazzi, and D. Ronzani, “A Comparison of Stateless Position-based Packet Routing Algorithms for FANETs,” IEEE Trans. Mob. Comput., vol. 17, no. 11, pp. 2468–2482, 2018.
- A. E. Abdallah, T. Fevens, and J. Opatrny, “High delivery rate position-based routing algorithms for 3D ad hoc networks,” Comput. Commun., vol. 31, no. 4, pp. 807–817, 2008.
- A. Nayyar, “Flying Adhoc Network (FANETs): Simulation Based Performance Comparison of Routing Protocols: AODV, DSDV, DSR, OLSR, AOMDV and HWMP,” 2018 Int. Conf. Adv. Big Data, Comput. Data Commun. Syst. icABCD 2018, no. October, pp. 1–9, 2018.
- BonnMotion (2015) A Mobility Scenario Generation and Analysis Tool. February 1. University of Osnabruck. Available: http://bonnmotion.net/.
- I. Bekmezci, O. K. Sahingoz, and Ş. Temel, “Flying Ad-Hoc Networks (FANETs): A survey,” Ad Hoc Networks, vol. 11, no. 3, pp. 1254–1270, 2013.
- K. Singh and A. K. Verma, “Experimental analysis of AODV, DSDV and OLSR routing protocol for flying adhoc networks (FANETs),” Proc. 2015 IEEE Int. Conf. Electr. Comput. Commun. Technol. ICECCT 2015, pp. 1–4, 2015.
- M. Arnani, “11 Provinsi Paling Rawan Kebakaran Hutan dan Lahan di Indonesia,” Kompas.com, 2018. [Online]. Available: https://nasional.kompas.com/read/2018/08/24/17291701/11-provinsi-paling rawankebakaran-hutan-dan-lahan-diindonesia?page=1. [Accessed: 03-Jul2019].