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# THERMAL SCIENCE

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### GIS-BASED COMPUTER CODE FOR THE EVALUATION OF FOREST FIRE SPREAD

#### ABSTRACT

The approach to the implementation of a computer code, based on the geographic information system, for the forest fire behavior prediction is presented. Consecutive steps are considered, which include the formulation of fire spread mathematical model, classification of vegetation fuels using the forest inventory data, approximation of fire perimeter propagation, and overall arrangement of fire simulation code

#### KEYWORDS

forest fire, fire spread model, flame radiation, vegetation fuel, computer simulation, fire behavior system, geographic information system

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REFERENCES [view full list]

1. Burgan, R. E., Rothermel, R. C., BEHAVE: Fire Behavior Prediction and Fuel Modeling System - FUEL Subsystem, General Technical Report INT-167, Ogden, Ut., USA, USDA Forest Service, Intermountain Research Station, 1984
2. Andrews, P. L., BEHAVE: Fire Behavior Prediction and Fuel Modeling System - BURN Subsystem, part 1, General Technical Report INT-194, Ogden, Ut., USA, USDA Forest Service, Intermountain Research Station, 1986
3. Andrews, P. L., Chase, C. H., BEHAVE: Fire Behavior Prediction and Fuel Modeling System - BURN Subsystem, part 2, General Technical Report INT-260, Ogden, Ut., USA, USDA Forest Service, Intermountain Research Station, 1989
4. Andrews, P. L., Bevins, C. D., Update and Expansion of the BEHAVE Fire Behavior Prediction System, Proceedings, 14th Conference on Fire and Forest Meteorology, Luco-Coimbra,

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5. Andrews, P. L., Bevins, C. D., Seli, R. C., BehavePlus Fire Modeling System, version 2.0: User's Guide, General Technical Report RMRS-GTR-106WWW, Ogden, Ut., USA, USDA Forest Service, Rocky Mountain Research Station, 2003
6. Andrews, P. L., Bevins, C. D., Seli, R. C., BehavePlus fire modeling system, version 3.0: User's Guide, General Technical Report RMRS-GTR-106WWW Revised, Ogden, Ut., USA, USDA Forest Service, Rocky Mountain Research Station, 2005
7. Finney, M. A., FARSITE: Fire Area Simulator - Model Development and Evaluation, Research Paper RMRS-RP-4, Ogden, Ut., USA, USDA Forest Service, Rocky Mountain Research Station, 1998
8. Green, K., Finney, M., Campbell, J., Weinstein, D., Landrum, V., FIRE! Using GIS to Predict Fire Behavior, *Journal of Forestry*, 93 (1995) 5, pp. 21-25
9. Keane, R. E., Garner, J. L., Schmidt, K. M., Long, D. G., Menakis, J. P., Finney, M. A., Development of the Input Data Layers for the FARSITE Fire Growth Model for the Selway-Bitterroot Wilderness Complex, USDA Forest Service, General Technical Report RMRS-GTR-3, 1998
10. Albini, F. A., An Overview of Research on Wildland Fire, Proceedings, 5th International Symposium on Fire Safety Science, IAFSS, Melbourne, Australia, 1997, pp. 59-74
11. Weber, R. O., Modeling Fire Spread through Fuel Beds, *Progress in Energy and Combustion Science*, 17 (1991), 1, pp. 67-82
12. Rothermel, R. C., A Mathematical Model for Predicting Fire Spread in Wildland Fuels, Research Paper INT-115, Ogden, Ut., USA, USDA Forest Service, Intermountain Forest and Range Experiment Station, 1972
13. Telitsyn, H. P., Dependence of Forest Fire Spread Rate upon Weather Conditions (in Russian), Far Eastern Forestry Research Institute, Khabarovsk, USSR, 1965, Vol. 7, pp. 391-405
14. Telitsyn, H. P., Sosnovshenko, A. P., Characteristics of Forest Fuels and its Dependence upon Burning Features (in Russian), Far Eastern Forestry Research Institute, Khabarovsk, USSR, 1970, Vol. 10, pp. 248-252
15. Telitsyn, H. P., Flame Radiation as a Mechanism of Fire Spread in Forests, in: *Heat Transfer in Flames* (Ed. N. H. Afgan, J. M. Beer), John Wiley and Sons, New York, USA, 1974, pp. 441-449
16. Telitsyn, H. P., A Mathematical Model of Spread of High-Intensity Forest Fires, in: *Fire in Ecosystems of Boreal Eurasia* (Ed. J. G. Goldammer, V. V. Furyaev), Kluwer Academic Publishers, Dordrecht, The Netherlands, 1996, pp. 314-325
17. Telitsyn, H. P., Karpov, A. I., On the Modeling of Forest Fires: from Physical Background toward Practical Output, Proceedings, 4th Asia-Oceania Symposium on Fire Science and Technology, Waseda University, Tokyo, 2000, pp.15-31
18. Emmons, H. W., Fire in the Forest, *Fire Research Abstracts and Reviews*, 5 (1964), 3, pp. 163-178
19. Albini, F. A., A Physical Model for Fire Spread in Brush, Proceedings, 11th Symposium (Int.) on Combustion, 1966, The Combustion Institute, Pittsburgh, Pa., USA, 1967, pp. 553-560
20. Van Wagner, C. E., Calculation on Forest Fire Spread by Flame Radiation, Canadian Department of Forestry, Report No. 1185, 1967
21. Thomas, P. H., Some Aspects of the Growth and Spread of Fires in the Open, *Journal of Forestry*, 40 (1967), 2, pp. 139-164
22. Anderson, H. E., Aids to Determining Fuel Models for Estimating Fire Behavior, General Technical Report INT-122, Ogden, Ut., USA, USDA Forest Service, Intermountain Forest and Range Experiment Station, 1982
23. Fischer, W. C., Photo Guide for Appraising Downed Woody Fuels in Montana Forests, General Technical Report INT-98, Ogden, Ut., USA, USDA Forest Service, Intermountain Forest and

- Range Experiment Station, 1981
24. Volokitina, A. V., Sofronov, M. A., Using Large Scale Vegetation Fuel Maps for Forest Fire Control, Proceedings, 2nd Asia-Oceania Symposium on Fire Science and Technology, Khabarovsk, Russia, 1995, pp. 83-89
  25. Keane, R. E., Burgan, R. E., van Wagtendonk, J., Mapping Wildland Fuels for Fire Management across Multiple Scales: Integrating Remote Sensing, GIS, and Biophysical Modeling, International Journal of Wildland Fire, 10 (2001), 3-4, pp. 301-319
  26. Scott, J. H., Burgan, R. E., Standard Fire Behavior Fuel Models: a Comprehensive Set for Use with Rothermel's Surface Fire Spread Model, General Technical Report RMRS-GTR-153, Fort Collins, Col., USA, USDA Forest Service, Rocky Mountain Research Station, 2005
  27. Lyons, P. R. A., Weber, R.O., Geometrical Effects on Flame Spread Rate for Wildland Fine Fuels, Combustion Science and Technology, 89 (1993), 1-4, pp. 153-165
  28. Ball, G. L., Guertin, D. P., Simulation of Fire Growth, International Journal of Wildland Fire, 2 (1992), 2, pp. 47-54
  29. Anderson, D. H., Catchpole, E. A., de Mestre, N. J., Parkes, T., Modeling the Spread of Grass Fires, Journal of Australian Mathematical Society (Series B), 23 (1992), 3, pp. 451-466
  30. Knight, I., Coleman, J., A Fire Perimeter Expansion Algorithm Based on Huygens' Wavelet Propagation, International Journal of Wildland Fire, 3 (1993), 2, pp. 73-84
  31. Richards, G. D., A General Mathematical Framework for Modeling Two-Dimensional Wildland Fire Spread, International Journal of Wildland Fire, 5 (1995), 2, pp. 63-72
  32. Grishin, A. M., Mathematical Modeling of Forest Fires and New Methods of Fighting Them, Tomsk State University, Tomsk, Russia, 1997
  33. Peterson, B., Hyde, P., Hofton, M., Dubayah, R., Fites-Kaufman, J., Hunsaker, C., Blair, J. B., Deriving Canopy Structure for Fire Modeling from Lidar, Proceedings, 4th International Workshop on Remote Sensing and GIS Applications to Forest Fire Management: Innovative Concepts and Methods in Fire Danger Estimation, Ghent University, Ghent, Belgium, 2003, pp. 56-65

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