

Predicting Forest Fires

FireDex



Team :

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Abstract

Forest fires are devastating, and can rage out of control. For example, the 2017 forest fires in British Columbia compelled thousands to escape, burned 1.2 million hectares of forest, and caused more than CAD \$500 million in damage. Moreover, pollution from the fires caused respiratory problems for people living hundreds of kilometers away. Predicting the source and spread of forest fires could have considerable benefits for human health and life, the economy and the environment.

Predicting forest fires will help identify areas of high risk so resources can be planned and managed for those areas ahead of time.

Summary:

This program is created in order to help predict the likelihood and severity of fire starting in a certain area in Canada through the weather and physical data collected there. The program uses the FFMC to predict the possibility of forest fire starting based off of weather and fuel condition data. The initial spread index is the calculation of the FFMC taking into account the wind level which fuels the fire with oxygen. The BPI measures the ratio of between how dry or damp the fuel that the fire consumes is. Finally, based on the initial spread and the buildup of fuel, we measure the FWI, possible severity of the forest fire. Given equations are based on the equations (See Appendix).

Appendix:

$$ISI = \left(\frac{FFMC \times (wind + 1)}{1170} \right) \times 16$$

$$BUI = \left(\frac{DC}{DMC} \right) \times 8$$

$$FWI = \left(\frac{ISI \times BUI}{30} \right)$$

$$FFMC = 59.5 \times \left(\frac{250 - m}{147.2 + m} \right)$$

$$m_d = (E_d + (m_0 - m_d) \times 10^{-k_d})$$
$$m_w = (E_w + (E_w - m_0) \times 10^{-k_w})$$

$$F = 59.5 (250 - m) / (147.2 + m)$$

Variables:

FFMC = Fine Fuel Moisture Code

Wind = wind

ISI = Initial Spread Index

DMC = Duff Moisture Code

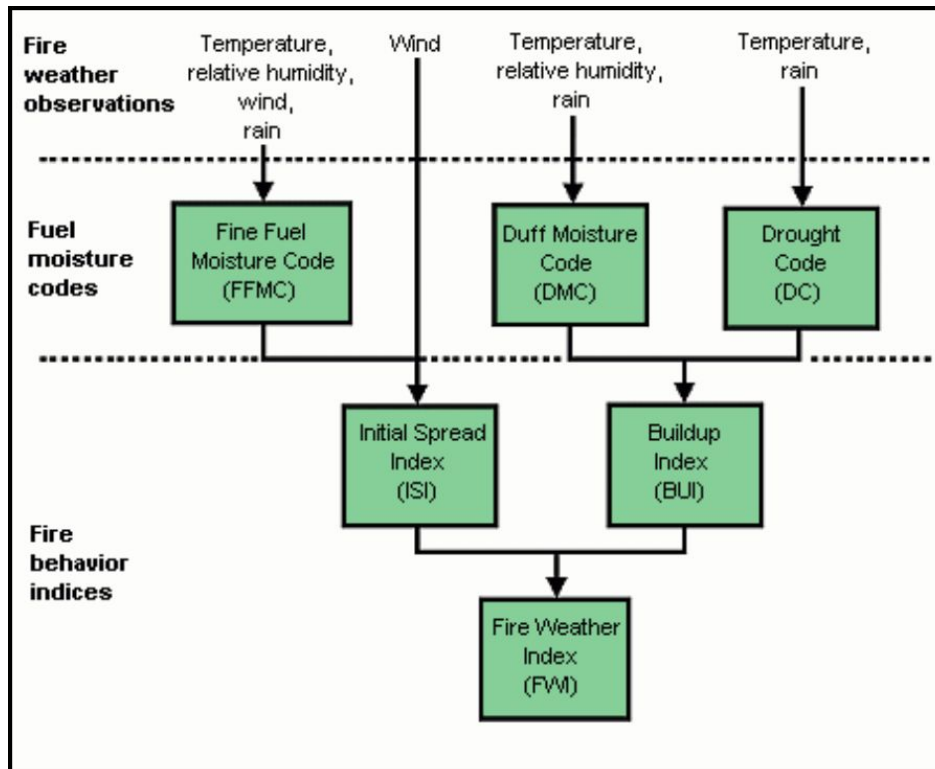
DC = Drought Code

BUI = Buildup Index

FWI = Fire Weather Index

m = moisture content

E = fine fuel equilibrium moisture content



References :

- http://docs.niwa.co.nz/eco/fwsys/ref/EquationsandFORTRANfortheCFFWI.pdf?fbclid=IwAR2uNSA1qv4NQxB6s9DXC-38b-GAtrWmbv0Vo_67sHIuIoG0w2GmHvKX5cl
- https://www.dw.com/image/19464620_401.jpg