LexTech

AFGROW.NET

AFGROW Workshop 2016

Recent Developments in AFGROW COM and Plug-In Applications

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AFGROW Plugins

- AFGROW Plug-in capability allows Users to Create/Animate their own structural models for use in AFGROW. It provides the capability for users to develop K-solutions that will manage crack size, solution limits and the general configuration of the solution (K-solution parameters, error checking, prediction process, and screen drawing functionality).

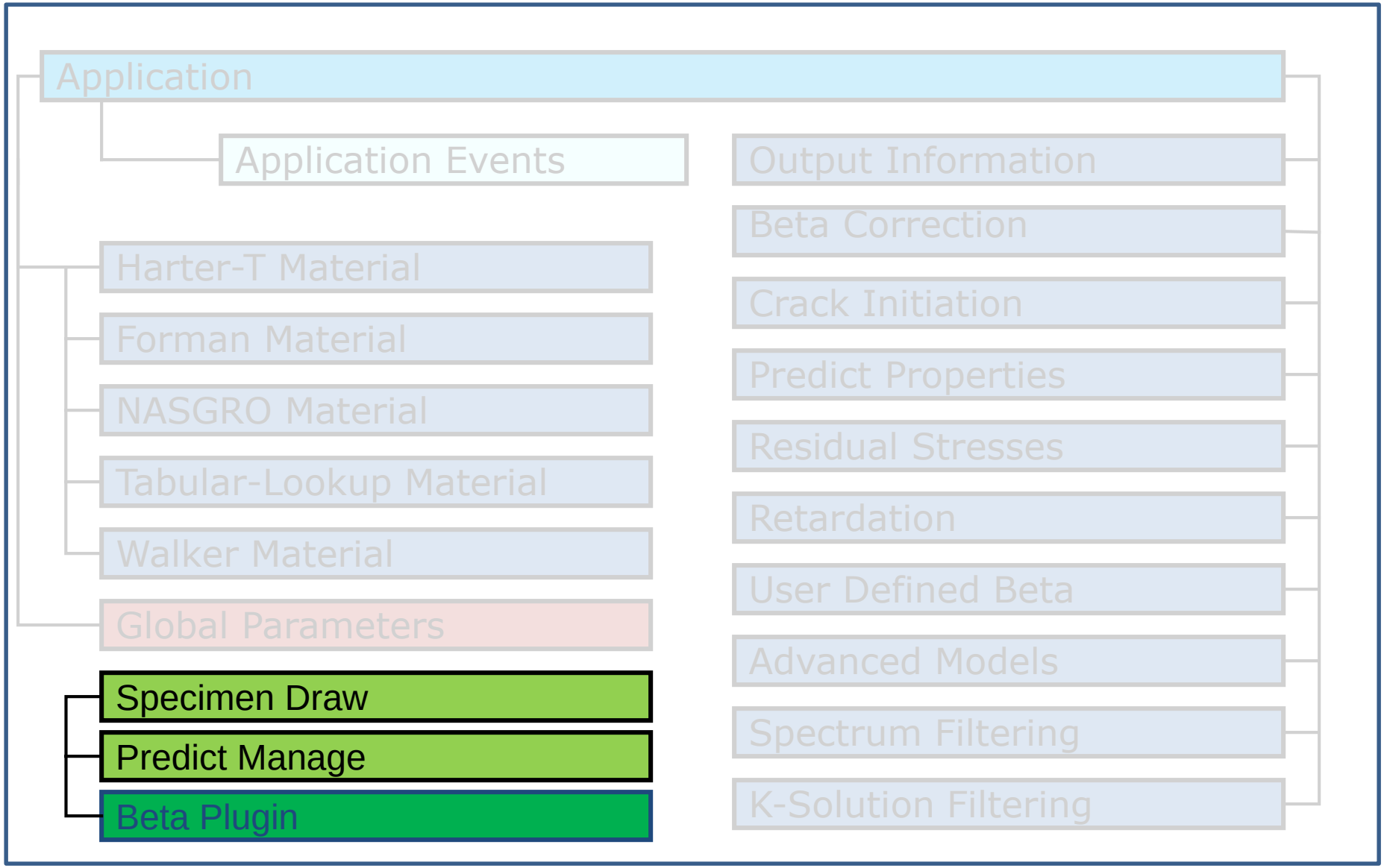
- AFGROW Plug-In technology allows the creation of Proprietary, Closed-Form, Tabular / Interpolative / Extrapolative, and External-K (if available) User-Defined custom solutions.

Managing the AFGROW plugin Lifecycle

The purpose of this presentation is to demonstrate the usage of plugin functions though the different stages of it's lifecycle:

- Plugin initiation
- User interaction with the plugin
- Setting up life prediction parameters
- Interaction with AFGROW during life prediction

Plugin Portion of the AFGROW Interface



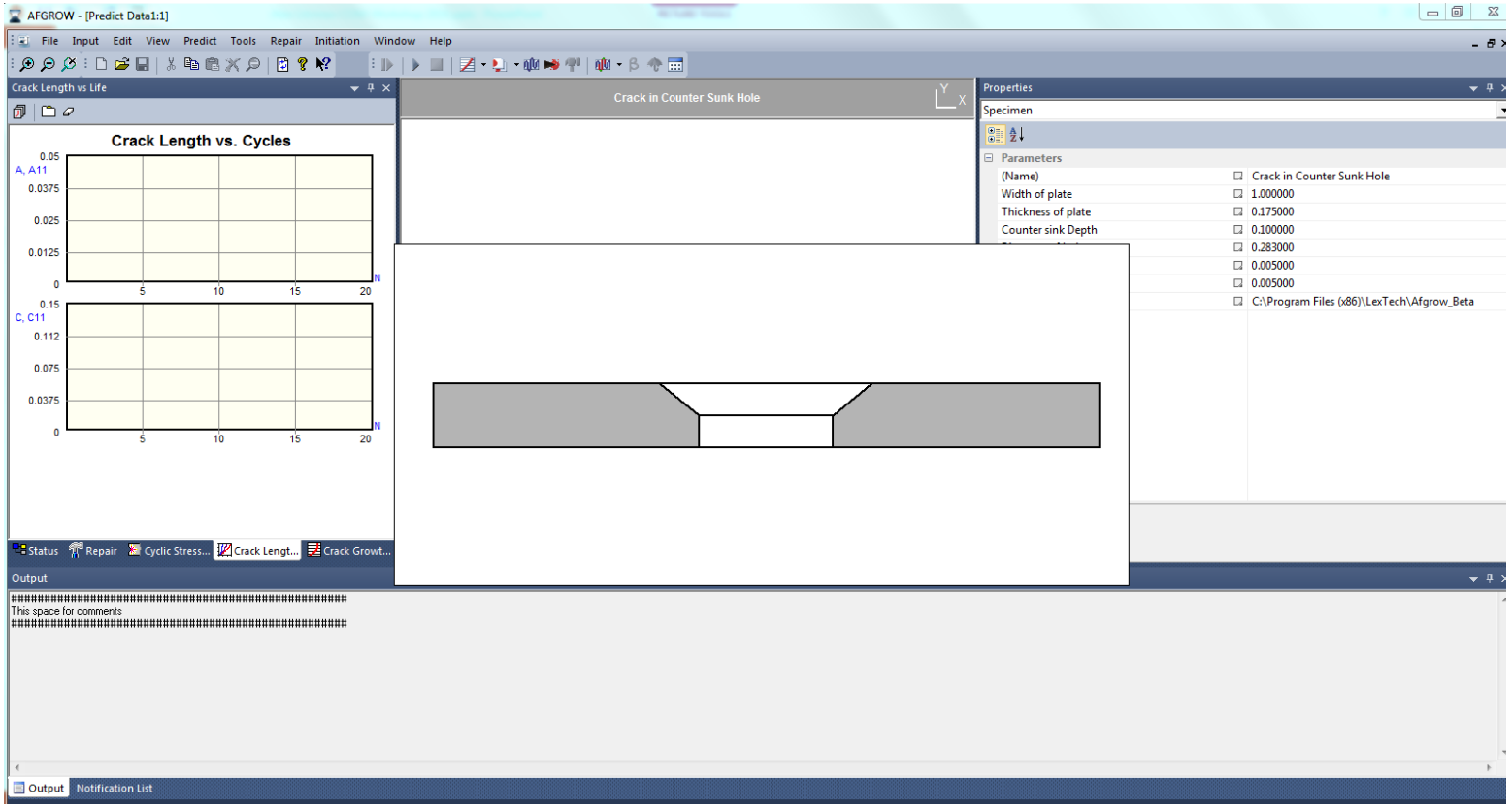
Beta Plugin Interface

- Responsible for providing properties, methods and events that AFGROW needs to implement and manage data input, validation, and life prediction for stress intensity factor solution models. The Beta Plugin Interface needs to be implemented by user.
- Examples are: Model name, model picture, geometry parameters, parameter validation.

Beta Plugin Interface Events

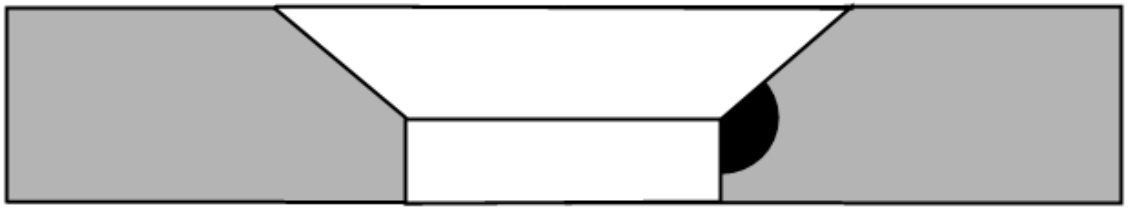
- Provided through the PredictEvent function:
  - AfgrowEventOutput - provide output information,
  - AfgrowEventCrackFailure - failure,
  - AfgrowEventCrackTransition - transition,
  - AfgrowEventError – not used,
  - AfgrowEventPredictStarted - predict started,
  - AfgrowEventPredictFinished - predict finished,
  - AfgrowEventCalculateBeta - need to calculate beta,
  - AfgrowEventStatusBar – not used,
  - AfgrowEventRefreshModel - set default paramaters,
  - AfgrowEventDeltaLengthReady – delta length is calculated,
  - AfgrowEventBeforePredict - before prediction

Example Beta Plugin Interface



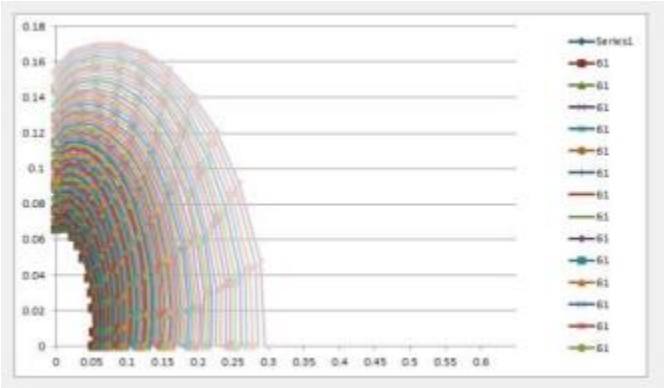
Specimen Drawing Interface

- It is used to draw a picture of the model as a visual aid for the user



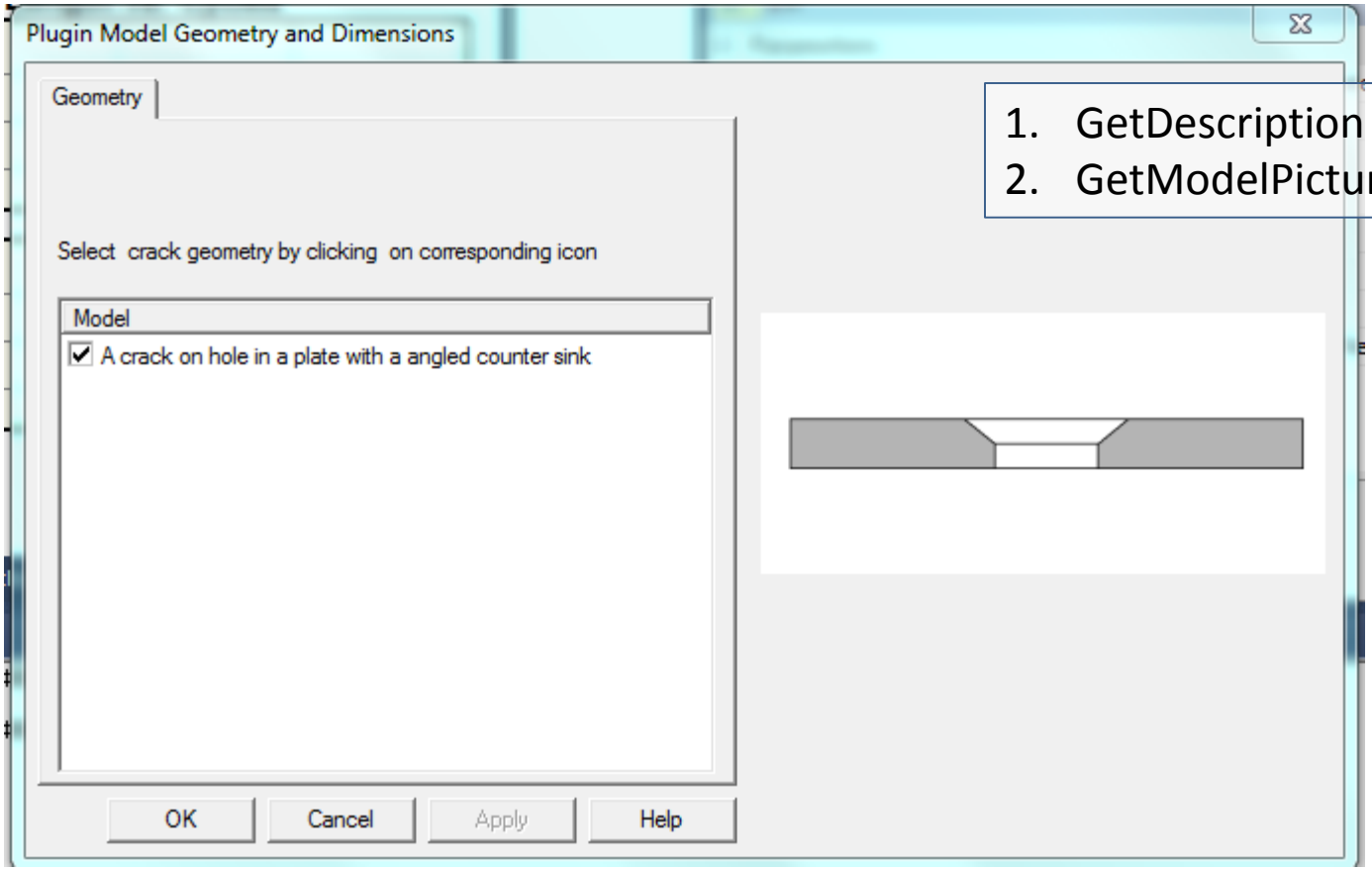
Predict Manage Interface

- Used to setup/read/modify number of cracks, crack directions, and crack direction parameters in AFGROW. AFGROW supports an unlimited number of cracks and crack directions for plugin models.



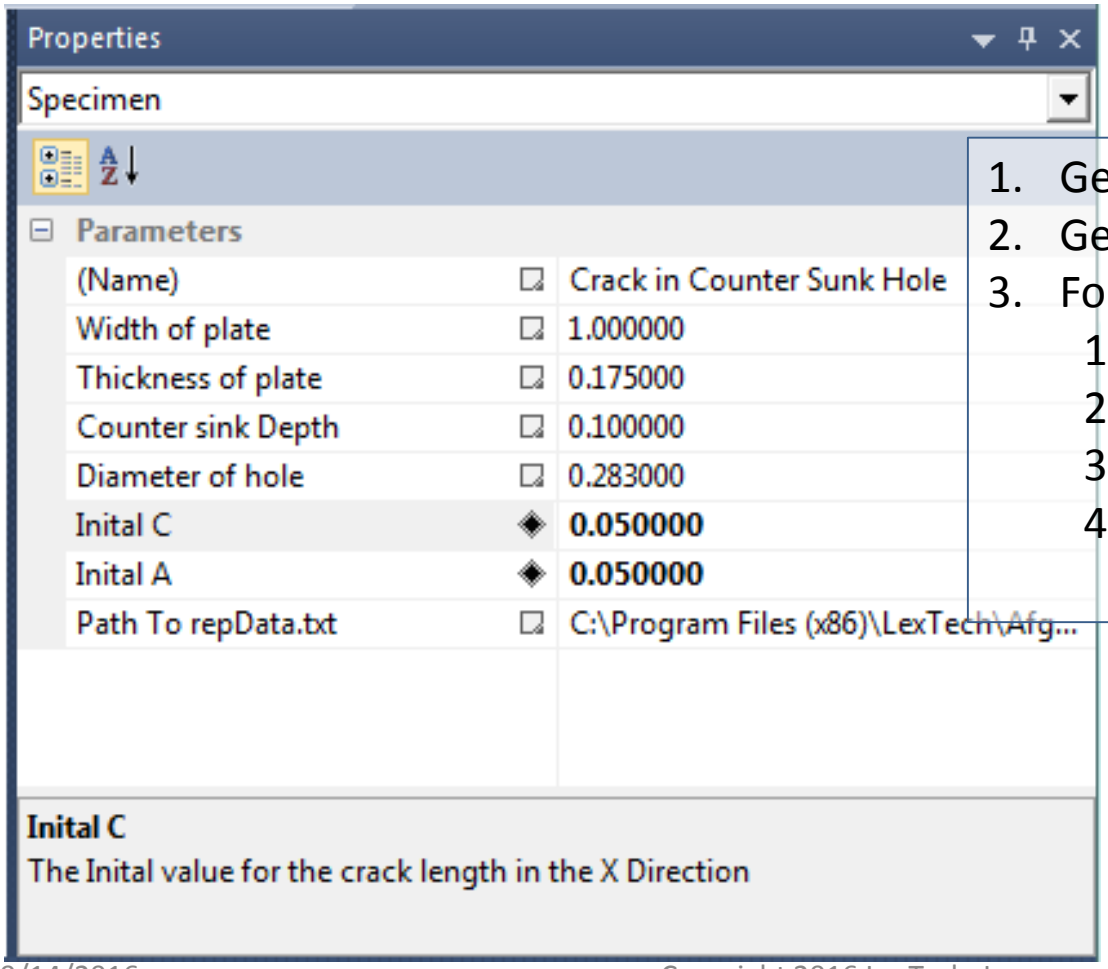
Picture from "BAMF with Residual Stresses" presentation by Joshua Hodges, T-38 Structural Integrity and Analysis Group at AFGROW Workshop 2014

Plugin Initiation – Select Plugin



1. GetDescription
2. GetModelPicture

Plugin Initiation – Preprocessing Properties



1. GetName
2. GetParameterList
3. For each parameter:
    1. GetParameterName
    2. GetParameterType
    3. GetParameterDescription
    4. Get….ParameterValue (double, enum, string, file)

User Interaction with the Plugin (updating plugin model properties)

1. GetParameterType
2. Set…ParameterValue (double, enum, string, file)
3. In case if error returned from plugin: Get…ParameterValue (double, enum, string, file)

Setting Up Life Prediction Parameters

1. PrePredictTest – Final data validation test
2. AfgrowEventBeforePredict – Used to extract non-model related data from AFGROW
3. AfgrowEventPredictStarted – Setup cracks, crack directions, and crack direction parameters such as: length, length limit, equivalent thickness

Interaction with AFGROW During Life Prediction

- After all crack length increment calculations: AfgrowEventDeltaLengthReady (opportunity to modify direction increment before it is used by AFGROW)
- When K-values are required (managed by Vroman increment): AfgrowEventCalculateBeta
- At each output increment: AfgrowEventOutput
- At each transition from part through to through crack: AfgrowEventCrackTransition
- At Failure: AfgrowEventCrackFailure
- When the analysis is finished: AfgrowEventPredictFinished

Questions?

Requested additions to AFGROW plugin model

- Add a plug-in model variable that can return the cycle count
- Access plugin models through COM
- Add ability to have plugin defined fracture criteria (declare fracture from plugin)
- Add function that checks is a crack direction exists

AFGROW COM API

COM Automation is one of the most popular and frequently used features of AFGROW. Automation is an industry-standard technology that applications use to expose their objects to development tools and macro languages. The COM abilities of AFGROW allow users to save time and money by automating manual tasks, incorporating AFGROW services into proprietary software, and enable the reuse of code that has been pre-built and tested.

Requested additions to AFGROW COM API

- Add/Fix the ability to manage multiple instances of AFGROW using the COM API
- Add a block size variable for constant amplitude loading (COM)