**Hot Pursuit NEO Tracking Application**

**Overview**

I’m thinking we should have a category in the TSX called “101 Fun Things To Do With TheSkyX”. This little application mostly falls under that moniker. As most of us know, a couple of hundred good sized rocks are discovered whizzing by the earth every year. Today, most of these Near Earth Objects (NEO’s) are identified by well-funded, organized projects, but a few are still by amateurs, here and there. However once spotted, each reported fly-byer goes through a phase where it must be confirmed and a precise orbit determined through multiple, independent measurements. During its time in purgatory, a NEO is listed on a NASA website called “Scout”. Once confirmed (by somebody, at some point, I guess) the object moves off of Scout and into the IAU Minor Planet Center database. But, for a time, one has a chance for a look at the equivalent of an astronomical UFO. That’s where this little app comes in.

Hot Pursuit works in conjunction with another little app called Transient Search. Transient Search enables a user to load the current Scout unconfirmed object list into TSX as a SDB catalog in about three clicks. (This too falls under the category of “101 Fun Things...”). Once loaded a user can pick a target and run Hot Pursuit whose sole job is to keep the mount pointed at that target. The reason it’s tricky is that these NEO’s move across the sky at a pace and direction somewhere between a satellite and a planet. At any given time, their apparent movement is anywhere between less than one to over a couple of thousand arcsec/min -- the drift continuously changes in speed and direction. So what Hot Pursuit does is get the current ephemeris information from Scout, then recalculates and interpolates the position and speed in down to one second intervals for the imager’s site. That calculation is passed to TSX in the form of real-time Tracking Speed changes over the course of the session. The user is free to use whatever imaging technique they prefer: long exposure, stacking, live stacking, video, etc. I don’t really care. But it can be a challenge – these objects are dim, normally a few magnitudes plus or minus of 20. The other challenge is that the Scout ephemeris is no better than the quality of the early orbital observations – which can just be bad sometimes. There are times when you can just be taking pictures of empty space – yeah, a bit of a crap shoot. But when it works, it’s kind of cool to catch the little guy tumbling along waiting to smack something.

General Workflow

1. From <https://github.com/rrskybox/TransientSearch/tree/master/publish>, download *TransientSearch.zip*, extract all files and open “*setup.exe*”.
2. From https://github.com/rrskybox/Hot-Pursuit/tree/master/Hot%20Pursuit/publish, download *HotPursuit64.zip*, extract all files and open “*setup.exe*”.
3. Launch *TheSky64*. From the TSXToolKit in the Start Menu: Launch *Transient Search*. Launch *Hot Pursuit*.
4. Transient Search: In the MPC NEO box, check “*Scout*” and select “*NEO*”.
5. TheSky64: *Edit->Paste Photo*. Pick a NEO asteroid from the Sky Chart.
6. Hot Pursuit: “*Pursue*”.
7. TheSky64: Image to taste.

Hot Pursuit is a Windows 10 desktop application whose purpose is to automate the tracking of a NEO object with TheSkyX.

Targets are input to TheSkyX using the *TSXToolKit Transient Search* application via the NEO Scout search. The user selects one then launches Hot Pursuit.

Hot Pursuit fetches the name of the current TSX target, queries the CNEOS Scout internet site for its current ephemeral data, slews the mount to the coordinates and changes the tracking to match the target’s pace. Hot Pursuit recaptures the ephemeral data and resets tracking speeds every few minutes as set by the user.

**Controls and Commands**

Graphical user interface, application

Description automatically generatedUpdate Period: Sets the rate at which the CNEOS Scout site is polled for new ephemeris data. The minimum period for ephemeris from Scout is 1 minute. If “Seconds” is selected, then Hot Pursuit will interpolate at the period set by the Update Period.

Pursue: Initiates query and tracking which is repeatedly updated according to the update period.

Abort: Cancels the query and update, but does not close the program.

Close: Closes the program.

**Structure**

**Diagram

Description automatically generated**

**Operation**

Diagram

Description automatically generated

Diagram

Description automatically generated**Translation**

**Requirements**

Hot Pursuit is a Windows Forms executable, written in Visual C#. The app requires TheSkyX Imaging Edition (Build 10966 or later). The application runs as an uncertified, standalone application under Windows 10 (also Win 8, maybe).

**Installation**

As of this writing, the installation packages for Hot Pursuit are available on GitHub in the “publish” directory of rrskybox/Hot-Pursuit.

Download the HotPursuit.zip and extract. Run "setup.exe". Upon completion, an application icon will have been added to the start menu under "TSXToolKit" with the name "Hot Pursuit". This application can be pinned to the Start if desired.

**Support**

This application was written for the public domain and as such is unsupported. The developer would happily entertain questions or suggestion and may update the application occasionally as time permits. Otherwise, the developer wishes you his best and hopes everything works out but recommends learning Visual C# (it's not hard and the tools are free from Microsoft) if you find a problem or want to add features. The source is supplied as a Visual Studio 2019 project on GitHub