PickTool Help

PickTool is a MATLAB facility for picking seismic data that is designed to run on top of a seismic display that already exists in a MATLAB figure. This means that PickTool will not plot your data and expects you to give it the handle of the Figure or Axes in which your data is displayed. Then PickTool will adjust the size of the figure (usually making it larger) and make room for some additional controls to be placed to the right of the seismic display. These tools facilitate the automatic picking of horizons on the seismic section and the subsequent editing of these picks. Editing is generally required because it is difficult, perhaps impossible, to have an automatic picker that always does what the eye wants. These picking controls are grouped into three separated boxes. The topmost is labelled "Horizon Autopicking" and contains controls for automatically picking and repicking horizons, loading a save horizons file, deleting, sorting, or listing horizons, and changing horizon color. The second group is labelled "Pickediting" and contains tools to edit already picked horizons (adjust the automatic picks) and to save you results to a file.

NOTE: At present, if you close your window without clicking either "Stop and save" or "Stop and save as" you will lose your work and no warning will be given.

At this time, the autopicking facility is encoded in the function *picker* while the editing of picks is done with *editlines*. The controls that PickTool places on the seismic window are intended to facilitate the easy usage of these two tools and to allow the picks to be save in an organized fashion to disk. The picks are stored in a MATLAB structure, called the *pickstruc*, that at present has eight (8) fields. A given pickstruc can contain any number of horizons but they should all come from the same seismic line. Logically, a pickstruc can handle 2D or 3D data but at present PickTool only works well in 2D. The eight fields of a pickstruc are all cell arrays and must be the same length. While it is possible for knowledgeable MATLAB users to create their own pickstruc's, it is expected that most will prefer to let PickTool do this for them.

PICKSTRUC fields:

1) pickstruc.hornames … a cell array or horizon names. Each entry in the array is the name of a particular horizon as a text string. For example, pickstruc.hornames{1}='tecla'; and pickstruc.hornammes{2}='dakota'; initializes a pickstruc with two horizons, tecla and dakota.
2) pickstruc.horcolors … a cell array of RGB color specifications for each horizon, given in the same order as in hornames. In MATLAB RGB color specifications are vectors of length 3 of the form [r g b] where r,g,b are numbers between 0 and 1 giving the strength of red, green, and blue respectively. Thus [1 0 0] is red, [0 0 1] is blue, and [0 1 1] is yellow.
3) pickstruc.horpicks … a cell array of the picks for each horizon. For horizon number k, the pickstruc.horpicks{k} is an n-by-3 matrix where n is the number of picks. The first column gives the pick times, while columns 2 and 3 are the x and y coordinates respectively. For 2D data the y coordinates can be set to any constant value such as 0. The pick times are real numbers in seconds but can be NaN (not a number) to denote a missing pick.
4) pickstruc.horattrs … a cell array of horizon attributes associated with each pick. For each horizon, these are n-by-m matrices where n is the number of picks and m is the number of attributes. Eventually PickTool will facilitate the extraction of a variety of attributes, but at present there are only two: pick amplitude and amplitude of the Hilbert envelope. Only scalar attributes are supported.

5) pickstruc.horattrnames … a cell array of the names of the horizon attributes found in pickstruc.horattrs. For a given horizon, if pickstruc.horattrs{k} is a matrix with m columns, then pickstruc.horattrnames{k} must be a cell array with m text strings. Thus pickstruc.horattrnames is a cell array of cell arrays.

6) pickstruc.horpicktypes … a cell array of text strings, one per horizon, denoting the type of autopicking that was performed. These might be things like 'nearest peak', 'nearest trough', or 'nearest – to + zero crossing' where nearest refers to the guide points discussed in the next field. These strings are provided by *picker* and at present there are 12 possibilities. So see the complete list use the command picker('methods').

7) pickstruc.horguides … For each horizon this is an n-by-3 matrix giving the guide points used to inform the autopicker of the general shape and location of the event of interest. PickTool provides the ability to define these points by mouse clicks made directly on the seismic image.

8) pickstruc.horfwys … For each horizon, this is a scalar value giving the width (in seconds) of a fairway centered on the guide points (see the previous field) withing which the autopicker is constrained to obtain its results.

Launching PickTool

It is recommended that you read the launch instructions found by typing *help picktool* at the MATLAB prompt. Nevertheless, the simplest way to start using PickTool is to first ensure that your seismic data is displayed in a Matlab figure and that figure is the current figure. Usually, a figure can be made current by clicking in it. Alternatively most figures have a unique number which is an integer shown in the title bar of the figure. You can click anywhere in the figure to make it current or, alternatively, the command *figure(figno)* where figno is the figure number will make the figure current. Then, launch PickTool by typing *picktool(gcf)* where gcf means *getcurrentfigure* and causes Matlab to return the current figure number. After this command PickTool will resize the figure and the seismic image to allow easier picking and to make room for the necessary controls which will appear to the right of the seismic axes. PickTool will also offer the chance to load a saved pickstruc file from a previous session. Note that it is entirely possibly to load mistakenly a pickstruc from an entirely different line and the user must take care to ensure this does not happen.

Special instructions for Plotimage: If you have plotted your data in plotimage, then PickTool is already integrated into that program but the feature is currently hidden while being tested. To activate PickTool in plotimage, make sure the plotimage window is current (click in it) and then type the command:

>> enablepicktool

This will cause a new button to appear in the lower left of the plotimage window with the label "Launch PickTool". Push this button.

Autopicking horizons

1) Click the 'New horizon' button and provide a name and choose a color for the horizon. When you push the OK button after specifying a color, a window with instructions will appear. You should read these at least once in life. This window can be left open in case you wish to refer to it later.

2) Next, you will probably want to zoom in time to magnify the zone of the intended event. Push the zoom button and draw a zoom rectangle with the mouse.

3) Now you need to define the guide points on the event. These are points that guide the autopicker and you should define a point every time the event you are picking changes dip or character. At this point, you need to decide if you are picking a peak, trough or zero crossing and try to make your guide points conform to this decision. You define these points simply by clicking with the left mouse button. You don't have to click them in any particular order because they will be sorted by spatial location. This means that you cannot specify an event that is double valued in time (i.e. has more than one time at a given x). The only way at present to handle a double-valued event is to pick it as two or more separate horizons. As you pick these points, try not to pick too many. With reasonable quality data from a sedimentary basin, you should be able to pick a strong event across several thousand traces with a dozen or so guide points. Subtle or discontinuous events will require more points. You can always re-pick the horizon and add more points. Also, try to pick roughly the same phase across the section. Don't pick a peak sometimes and a trough other times. You can delete guide points by left-clicking on an already defined point. Finally, when you are ready to send these guide points to the autopicker, click the right mouse button.

4) When the right mouse button is clicked to signal the guide points have been defined, a new window will appear that allows you to specify the time width of the picking fairway and also to specify exactly how the picks will be made (the picking method). The picking fairway is a time zone centered on the guide points (linearly interpolated between guide points) within which the autopicks must occur. The default half-width is .020 sec meaning that the autopicks will never be more than +/- 20ms from the guide event. You specify picking method with a popup menu at the bottom of this window. These methods are defined by *picker* and can change if a new method is created. Choose this method carefully and make sure your choice is consistent with you guide points. This means, for example, that if you picked your guide points on a trough, don't choose to autopick on a peak. Once you have chosen your method, click the 'done button and the *picker* will run and the results will be posted on top of your seismic. Another dialog will appear giving you the choice of keeping this result, autopicking again, or discarding the result. If the result looks reasonable with only a few problems, then choose to keep it. If you choose "autopick again" you can re-specify the picking fairway and choose a different picking method but you cannot change the guide points. If you want to change the guide points, then you must choose to accept this result and then re-pick it with the "Repick horizon" button.

5) When you accept the result, you will then be asked to choose what to do about missing picks or to extend the event to the section edge. Missing picks are filled with simple linear interpolation and the extension to the edges is done with constant-time extrapolation.

Other actions in the Autopicking category include:

- "Load horizons" … allows a saved pick file to be loaded. You will be given the option to discard any current picks or merge them with the one you are loading. This gives you a way to combine two pick files. Be sure you have saved your current picks before choosing "discard".
- "Repick horizon" … much the same as picking it from the start except that your previous guide points are displayed and you start by either adding to them or deleting some of them.

- "Delete horizon" … allows one or more horizons to be deleted.
- "Sort horizons" … sorts horizons into order of increasing average time (or depth).
- "Legend on/off" … guess what this does
- "Change horizon color" … also obvious
- "List defined horizons" … shows a list of all of your horizons and the picking method used.

Pick editing

These tools allow you to change or adjust the pick made by the autopicker. You can do almost anything here given enough patience. The edits are all done with the 'left', 'middle', and 'right' mouse buttons. Since it is common for computers to have a mouse with two button or even a single button, it is helpful to understand how to simulate a 'right' mouse button when you don't have such a button. As the table below shows, you simulate a 'right' button click with 'control-click-left' button. This means that you hold down the 'control' key (or 'ctrl') as you click the left button. If you have only one mouse button, it is the 'left' button.

Button Type	Microsoft Windows	Linux	Mac
'left'	Click left mouse button.	Click left mouse button.	Click left mouse button.
'middle'	Either of the following: **Shift**-click left mouse button. Click both left and right mouse buttons.	Either of the following: **Shift**-click left mouse button. Click middle mouse button.	Any one of the following: **Shift**-click left mouse button. Click middle mouse button. Click both left and right mouse buttons.
'right'	**Control**-click left mouse button or click right mouse button.	**Control**-click left mouse button or click right mouse button.	**Control**-click left mouse button or click right mouse button.

To edit picks, click the 'Start editing picks' button and the button will turn yellow indicating that pick editing is on. Now, click the 'left' mouse button on the horizon that you with to edit and the horizon will change its appearance showing individual picks a small circles. You will generally want to zoom in to enlarge the area to be edited. Note that clicking the 'left' mouse button off of any event will cause them all to return to normal appearance but the 'Start editing picks' button will still be yellow. This is just a temporary suspension of editing. Clicking on any horizon will put it in edit mode. Once the horizon is in edit mode you can move picks either individually or in groups. Individual pick moves are done with the 'left' button while group moves are done with the 'right' button. To move an individual pick, click and drag it ('left' button) from the old to the new location. Not that by default picks are allowed to move only vertically so that the pick stays on the trace it was originally made on. You can change this behavior with the 'motion' popup but be careful, you should usually use the default.

Groups of picks can be moved all at once by clicking and dragging with the 'right' mouse button. By default, the entire horizon is considered as a single group so a 'right' click and drag on any point will move the entire horizon. This is generally not a good thing. Instead, you will want to define a smaller group by 'anchoring' the end points of the group. A point can be anchored by a 'right' click on it without any drag. When a point is anchored it will be shown with a larger red circle around the point. If you anchor two points on the same horizon that are some distance apart, then you can move all of the points between the anchors as a group. This is done by right clicking on a point between the anchors and dragging it. There are two types of group move: 'constant drag' and 'elastic drag' and you can choose which by a popup menu. With 'constant drag', all points in the group move by the same displacement as the point that you are dragging. This means that it does not matter which point you click-and-drag. For 'elastic drag' only the point you clicked on gets the full displacement and the displacement decreases linearly to zero at the end anchors. Once defined, anchors will remain until you clear them or close the Figure window. They are not saved in the pickstruc so they will not be present in your next editing session. You can clear a single anchor by simply 'right' clicking on it a second time. The 'Clear anchors' button will clear all anchors on all horizons.

Saving your work

While editing, it is good practice to save your picks frequently. You do this by clicking the 'Stop and save' or the 'Stop and save as' buttons. Clicking either button turns off pick editing (the 'Start editing picks' button will return to grey from yellow) and saves the picks to disk. The 'save as' button will prompt for a new file name. This is the only way to save your work and you should do it often. To resume editing after saving, simply click 'Start editing picks' again. The save picks file is simply a MATLAB binary file with a single variable in it named *pickstruc*. You can load a saved pick file into the MATLAB workspace with the *load* command and do anything you want with it.

Final thoughts

You can learn more about *PickTool* and *picker* by reading their online help:

>> help picktool

Or

>> help picker

If you have a new picking method that you want to try, study the function *picker* and add your method to it as a new method by copying the example of an existing method. If you do this properly, then *PickTool* will automatically be informed of your new method and facilitate its use.

Much more can be done with this technology and it is hoped that others will be inspired to try further extensions. Some possibilities are:

- First break picking of a bunch of shots
- 3D picking
- Joint PP and PS interpretation
- Horizon attribute computation and analysis
- Well tying and inversion