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A Novel Method of Trend Lines Generation Using Hough Transform Method

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Abstract

Trend lines are technical analysis tools that are recognized as efficient ways of finding stock and security trading patterns. Human-drawn trend lines, however, involve the use of many different rules, in accordance with the ability and theories of each investor. The aim of this paper is to design an algorithm that will allow a machine to draw trend lines to the same level a human can achieve and extract the significant features from them. In this paper, we present a novel approach of lines detection from series of data points using Hough transform method. The weighting method in our Hough transform algorithm can group the similar lines to reduce the number of trend line candidates. We tested the algorithm with stocks in Thailand stock market and the preliminary result shows that our approach can generate the effective trend lines and provided the effective features for further stock price analysis.

Keywords: Stock market, Trend lines, Hough transform, Feature Extraction

Introduction

A trend line is a basic technical analysis concept whereby a line is drawn over a chart to evince the pattern in a market or stock [1]. Drawing a trend line is as straightforward as drawing a straight line that associates to lows or highs of stock price to demonstrate the general pattern of a trend. These lines are utilized to slice through the noise of stock price movement and scope where the price trend is going, besides, distinguish zones of supportive and resistance threshold of the price movement.

Trend lines are utilized in many ways by traders. On the off chance that a stock price is moving amongst support and resistance trend lines, at that point, a fundamental speculation methodology regularly utilized by traders, is to purchase a stock at support and offer at resistance, at that point short at resistance and cover the short at support. The rationale behind this is the point at which the value comes back to a current key Trend Line it might be a chance to open new positions toward the pattern, in the conviction that the trend line will hold and the pattern will proceed further. A second way is that when value activity gets through the principal trend line of a current pattern, it is confirmed that the pattern might fall flat, and a trader may consider exchanging the other way to the current pattern or existing positions toward the pattern [2].Fundamentally, there are two kinds of trend lines: resistance line (Fig. 1) and supportive line (Fig. 2).

When the stock price breaks out from the support or resistance line, in general, it is very likely the stock price will continue to move in that direction. Fig. 3 show the example of stock pricebreak out.

Many investment tools attempt to provide instruments that can imitate human-drawn trend lines by calculating the local minima and local maxima of stock prices in a given time period and using them to

calculate relationships and draw trend lines. Tools in the market, however, continue to encounter problems with drawing trend lines that resemble human-drawn lines.

Fig. 1: Resistance line

Fig. 2: Support line

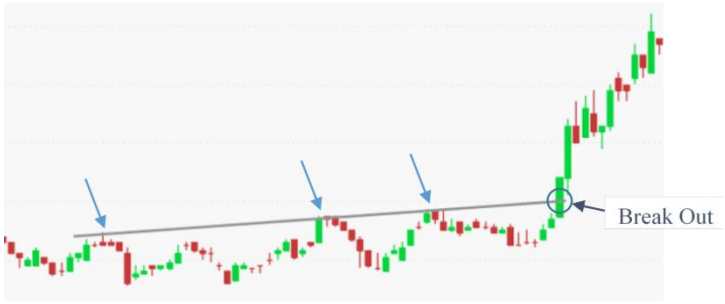


Fig. 3: Break out

Difficulties in creating support/resistance lines, including finding support/resistance values, are things finance experts are always attempting to overcome but have not yet been able to. This is because each trader's line-drawing technique differ and no one has yet been able to create a concrete mathematical model that can prove which technique has the most statistical significance.

The challenges are:

1) Some trend lines may change from support to resistance lines, or from resistance to support lines, shown in Fig. 4
2) The level of a trend line has noise, just as general time series data that isn't 100% accurate may have "slippage" or a "false break out". This means that trend lines drawn automatically with a machine will encounter problems detecting trend lines with slippage or false break outs, shown in Fig. 5.
3) In the past, algorithms for drawing trend lines would reference "close price" time series data, without also using high price and low price data in calculations. This gave rise to issues when algorithms were used in real conditions with high price volatility.

Trend lines are technical analysis tools that are recognized as efficient ways of finding stock and security trading patterns. Human-drawn trend lines, however, involve the use of many different rules, in accordance with the ability and theories of each investor. The aim of this research paper is to design an algorithm that will allow a machine to draw trend lines to the same level a human can achieve. The aim of this research paper is to design an algorithm that can be used to draw a trend line that is able to solve the various problems described above, regardless of whether these are problems regarding changes in the condition of the trend line or managing data "noise" that results in slippage or false break outs. The results of this research paper will be used to build a basic technical analysis tool that can further develop a chart pattern recognition system that is more accurate than tools developed in the past.

Fig. 4: Support lines changes to Resistance lines and Resistance lines changes to support lines.

Fig. 5: False break out

A great deal of intriguing work has been done in the range of applying Machine Learning Algorithms for analyzing price patterns and predicting stock prices. A Survey of using Machine Learning Techniques for Financial Time Series Forecasting are presented in [3]. Artificial Neural Networks (ANNs) recognized to be the prevailing machine learning method. The most ordinarily utilized features are opening, high, low, close prices and technical indicators. The most common technical indicators are the simple moving average (SMA), exponential moving average (EMA), relative strength index (RSI), rate of change (ROC), and moving average convergence / divergence (MACD). In [4] used data mining to discover the hidden patterns from the historic data that have probable predictive capability in their investment decisions.

They used Typical Price (TP), Chaikin Money Flow indicator (CMI), Stochastic Momentum Index (SMI), Relative Strength Index (RSI), Bollienger Bands (BB), Moving Average (MA) and Bollienger Signal to analyze the stock index. There are no published research paper that presented the utilization of features from trend lines. In this paper, we proposed a novel feature extraction from trend lines based on the investor experience used trend lines for trading.

The paper is organized in to following sections; section 1 is the introduction, section 2 is our proposed method, section 3 is the example results, and section 4 is the conclusion of this paper.

Methods

Line Detection by Hough Transform Methods

The Hough transform is a feature extraction and line detection technique used in the image processing, introduced by Paul Hough [5], [6]. The motivation behind the strategy is to discover flawed examples of items inside a specific class of shapes by a voting methodology. This voting technique is done in a

parameter space, from which object candidates are acquired as local maxima in an accumulator space that is unequivocally built by the algorithm for figuring the Hough transform.

The least complex instance of Hough transform is detecting straight lines. Ordinarily, the straight line can be represented by two parameters a and b, in a common form of an equation in two variables x and y.

$$y = mx + b \tag{1}$$

In the Hough space, lines are described by Equation 2

$$x\cos\theta + y\sin\theta = r \tag{2}$$

where r is the distance from the origin to line and θ is the angle of the line (see Fig.6)

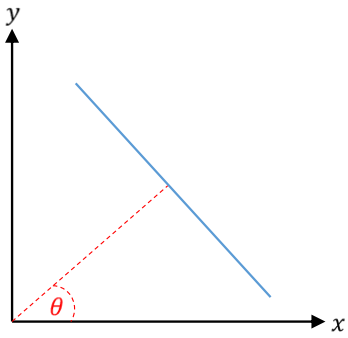
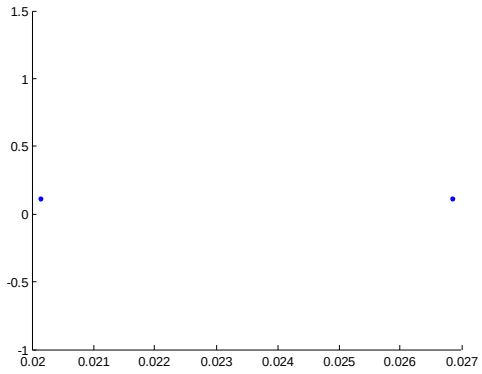
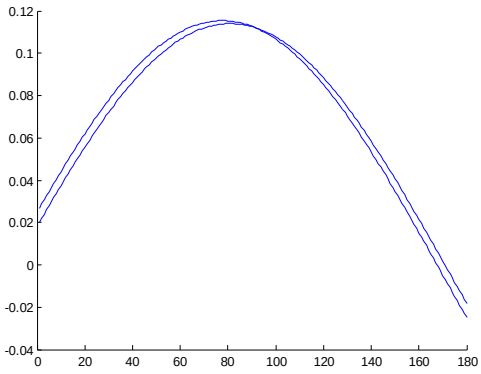


Fig. 6: Parametric description of a straight line

The fundamental idea for the Hough change is the mapping of single points. The idea is, that a point is mapped to all lines that can pass through that point. This yields a sine-like line in the Hough space. The example of transformation of points is showed in Fig. 7.



a) Point p_0 and p_1



b) All possible lines through p_0 and p_1 in the Hough space

Fig. 7: Transformation of two points to two lines in the Hough space. The crossing point of the Hough space lines indices the line that goes through both p_0 and p_1.

To decide the ranges where most Hough space lines cross, an accumulator covering the Hough space is utilized. At the point when a data point is changed, bin in the accumulator is augmented for all lines that could go through that point.

Trend Lines Generation

In this section, the overall processes of trend lines generation are described, Fig. 8 presented the flowchart of our method. First, stock data, high price, low price and close price, are found the local peak.

The data from local peaks are normalized by maximum and minimum values before the next step, Hough transformation. Accumulator matrix are calculated to extract the lines. Those extract lines are not all trend lines. We need to extract state of the stock price interact with those lines. There are four defined states which are touch stage, break out stage, false break stage and throw back stage. We called this process as a state extraction (Fig 9).

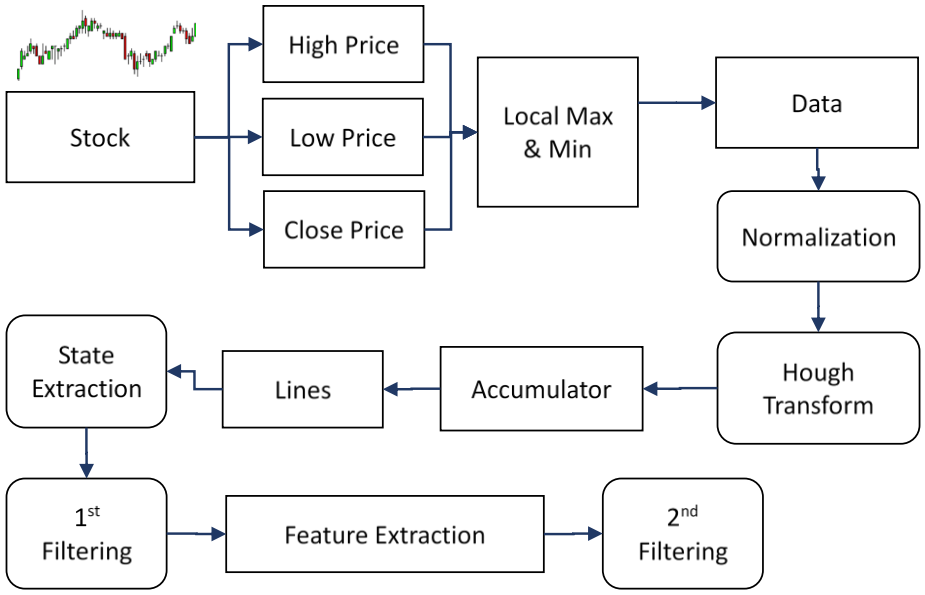


Fig. 8: Overall Process

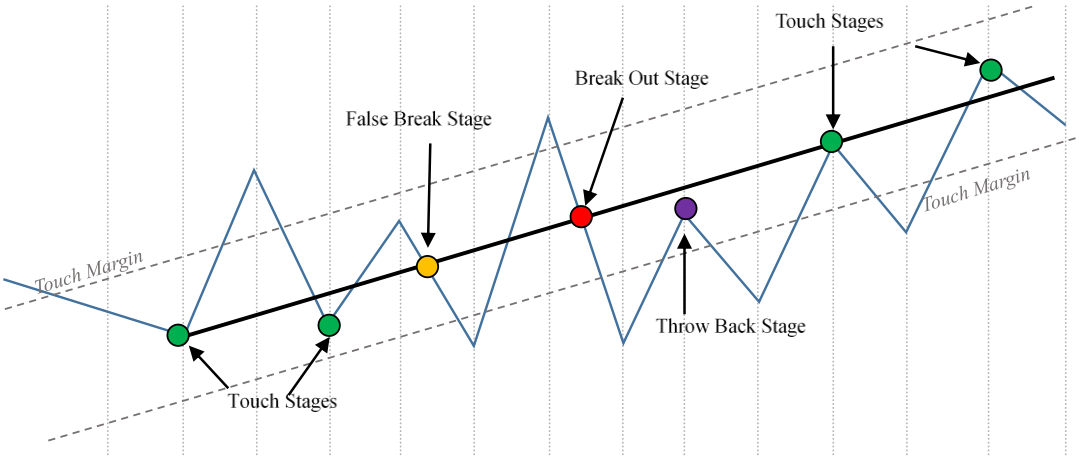


Fig. 9: Trend line's states:touch, false break, break out, and throw back.

Once we extract states of all lines as state sequence vectors, we used these state sequence vectors as criteria to filter out lines that do not satisfy trend line's properties of good state sequence. The sample of the validated trend line is shown in Fig.10. The sample of the invalidated trend lines are shown in Fig. 11.

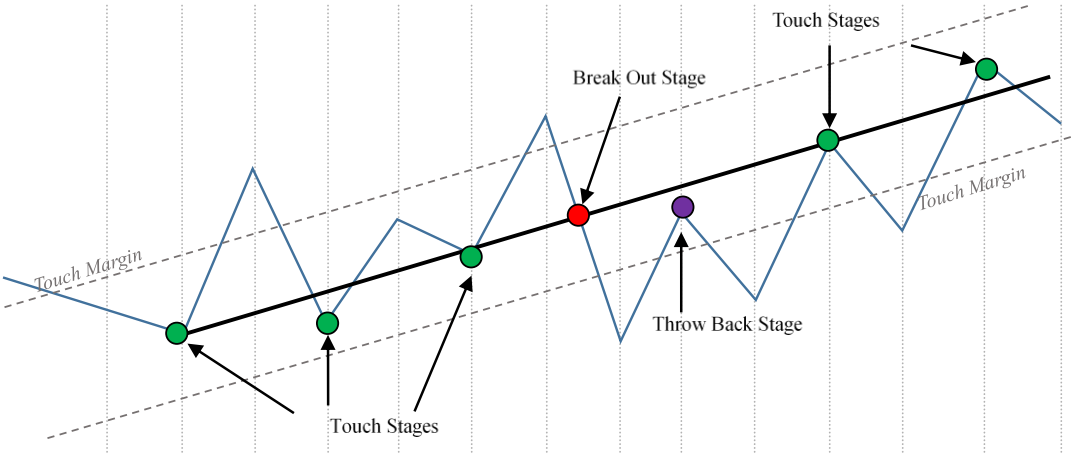


Fig. 10: Sample of validated trend line

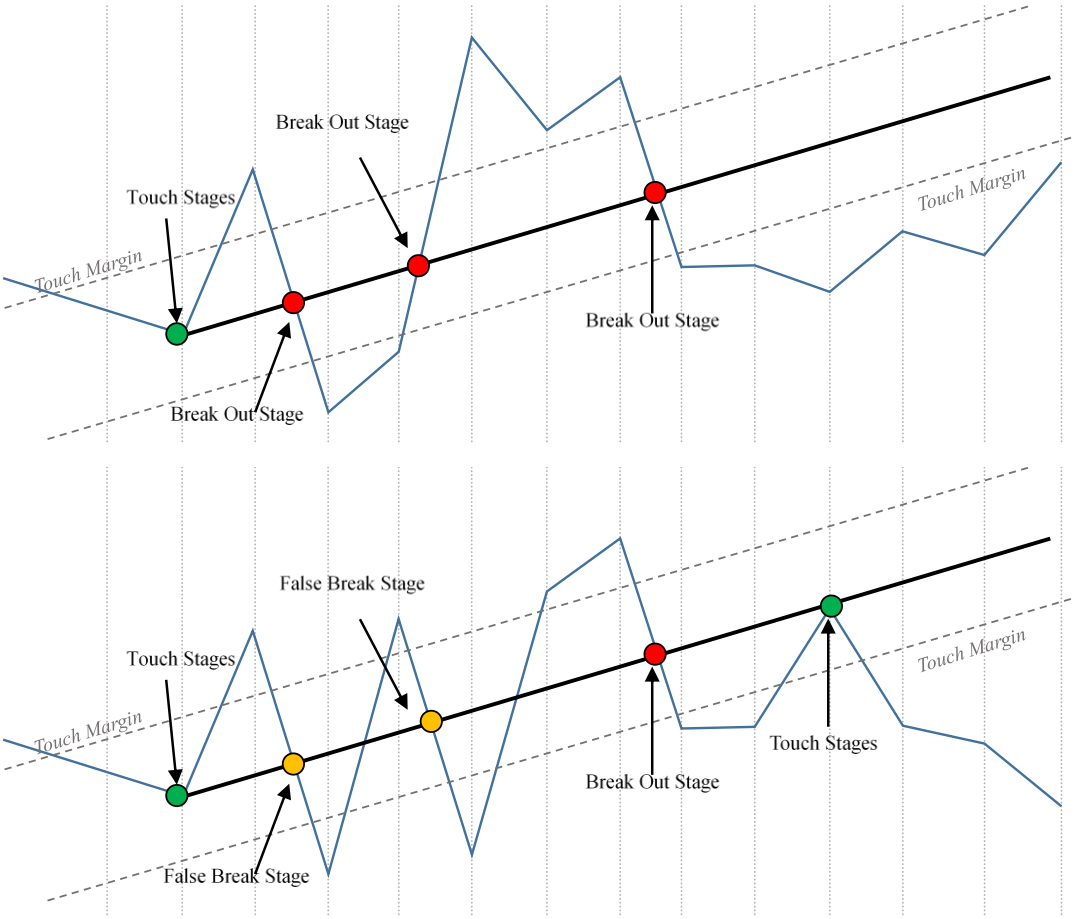
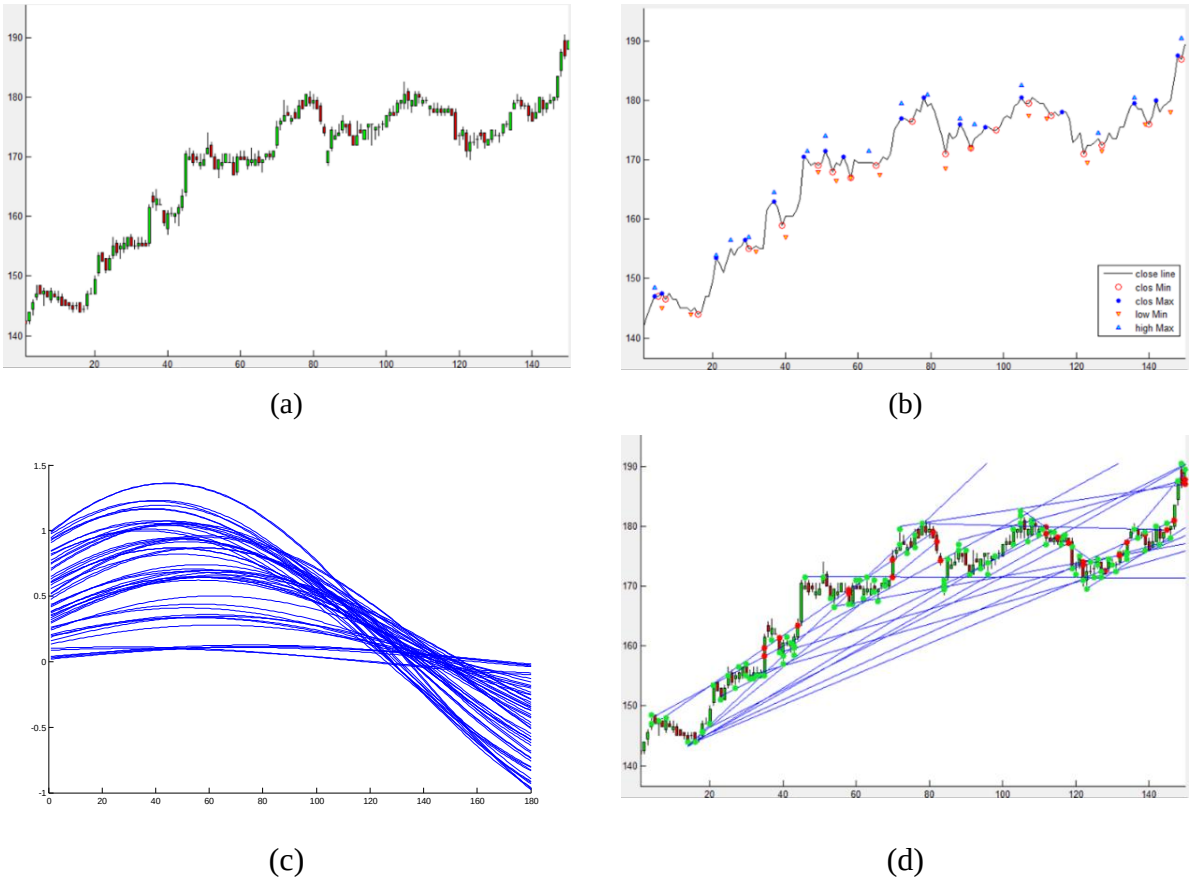


Fig. 11: Sample of invalidated trend lines

The next step is feature extraction. The significant characteristic of trend line are used as feature. The extracted features are state count vector, break out index, break out strength, trend line slope and etc. Finally, we calculated trend lines score by using predefined algorithm based on those extracted features and then filtered out low score trend lines. The example results of trend lines generation are shown in Fig. 12, (a) is the stock data, (b) is shown the extracted local peaks, (c) is Hough space, and (d) show all the generated trend lines after filtering.



(a) (b)

(c) (d)

Fig. 12: Example step of trend lines generation

Results

In this section presented some example result of trend lines generation and feature extraction from the stock of Thailand market. The trend lines are extracted from stock data in day period, we use the historical data back to 150 days (Fig 13-18).

a) SET, 31 trend lines

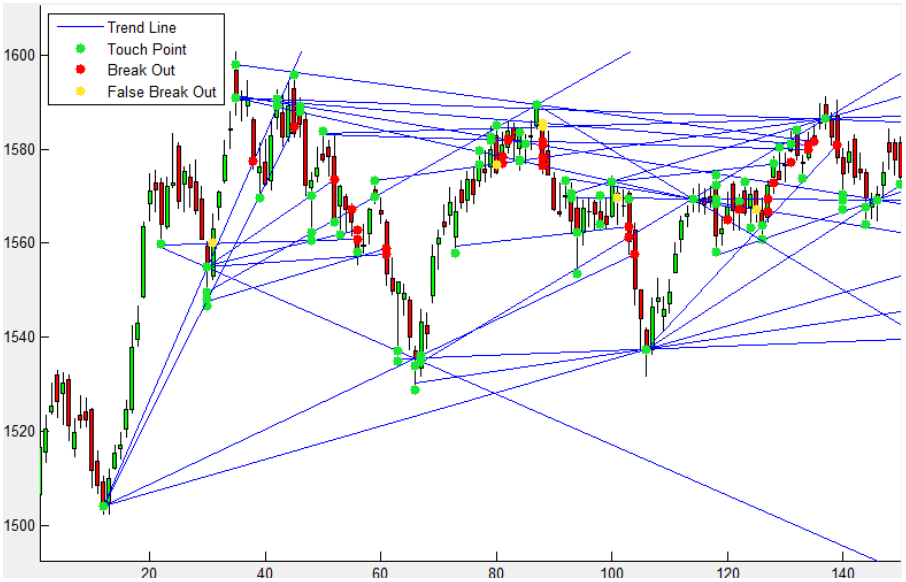


Fig. 13: The 31 trend lines of SET

Fig. 14: The example trend line of SET

b) AOT, 22 trend lines

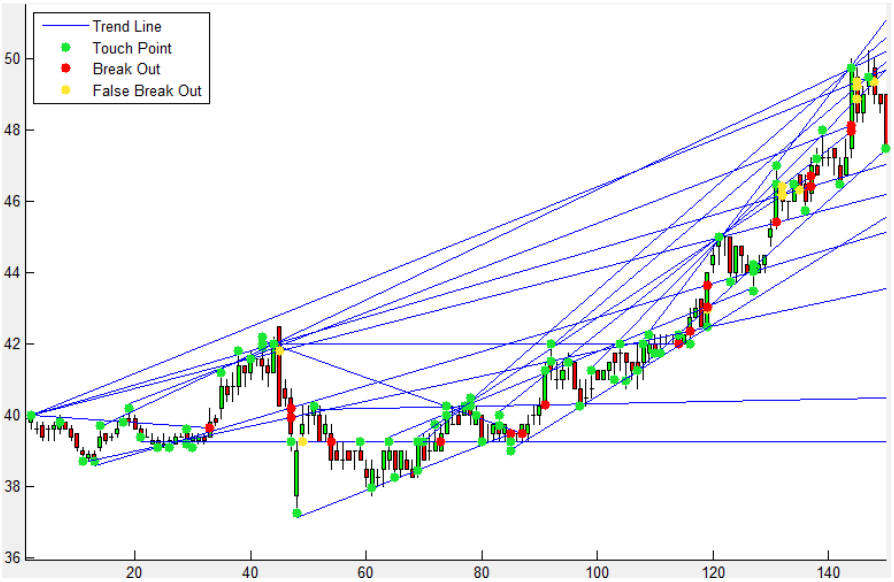


Fig. 16: The 22 trend lines of AOT

Fig. 17: The example trend line of AOT

c) RS, 25 trend lines

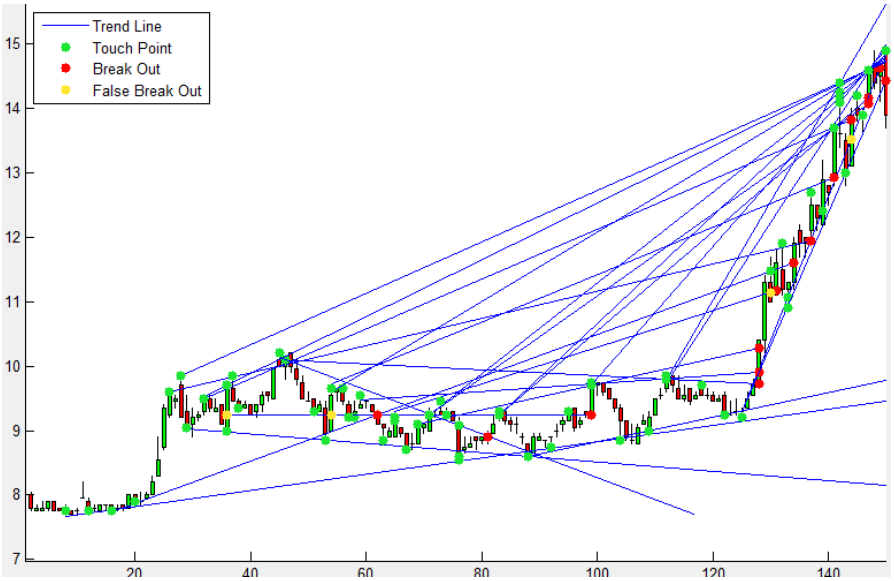


Fig. 18: The 25 trend lines of RS

Fig. 19: The example trend line of RS

Conclusion

In this paper we propose a novel method for generated trend lines and feature extraction using Hough transform method. The preliminary results show that our methodology can extracted the effective trend lines from stock data with the significant features. The automatic trend lines generation can help the investor to find a signal and security trading patterns to determine for investing. Future study, the extracted features combined with the typically features, such as price, technical indicators and fundamental data of stock, will be trained on deep learning or other machine learning algorithm for stock price analysis and automated trading.

References

[1] http://www.investopedia.com/university/technical/techanalysis3.asp

[2] Schlossberg, Boris (2006). Technical Analysis of the Currency Market: Classic Techniques for Profiting from Market Swings and Trader Sentiment. John Wiley & Sons. ISBN 9780471973065.

[3] Bjoern Krollner, Bruce Vanstone, Gavin Finnie. Financial Time Series Forecasting with Machine Learning Techniques: A Survey, ESANN 2010 proceedings, European Symposium on Artificial Neural Networks - Computational Intelligence and Machine Learning. Bruges (Belgium), 28-30 April 2010, d-side publi., ISBN 2-930307-10-2.

[4] Sekar P, Kannan K, Sathik M, Arumugam P. Financial Stock Market Forecast using Data Mining Techniques, Proceedings of the International MultiConference of Engineers and Computer Scientists, vol. I (2010) p. 5

[5] P.V.C. (1962) Hough. Method and means for recognizing complex patterns, U.S. patent 3069654.

[6] Shapiro, Linda and Stockman, George. "Computer Vision", Prentice-Hall, Inc. 2001.