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A New Approach for Congestion Control for TCP/AQM System in Wireless Network Environment

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Abstract - *The main aim of this paper is to use kalman filter in a different way. System initially was different means it was converted from continious time domain to discrete time domain. Also to implement kalmanfilter we transformed our form to another model. As per figure and graph we can see that with the increase of iteration estimated state is near true state . By this paper we are going to represent that drop of packets can also be estimated so that it can not drop before reached to destination or queue is full. Even when queue is short using probabilty approach we can maintain more frop probababilities. The basic feedback nature of AQM which can be enabledby application of different principles and this is how we developthis approach which is uniqueness of the model which has been developed recently.In TCP so many data packets are lostwith increase of rate in available bandwidth for a sender in a network. To reduce the rate of packet loss it has been observed thatmany drawbacks like packet dropping scheme which causes performance degradation due to restarts and time-outs. So in ourapporach we use a solution called RED(Random Early Detection)which assist routers for managing network performance. RED acts promptly instead waiting data packet loss.*

Key Words: transmission control protocol, real time, Random Early Detection data packets, synchronization.

1. INTRODUCTION

The development of new active queue management (AQM) routers will play a key role in meeting tomorrow's increasing demand for performance in Internet applications. A new developed active queue management (AQM) comes in role for increase of demand to perform better in internet applications. Where applications like (VoIP) voice over IP, (COS) class of service, streaming video where significant variations for packet size and session duration exhibit. This paper has got three objectives. 1st, AQM problem relates to key network parameters. 2nd, to analysis of the present *de-facto* AQM standard i.e. random early detection (RED) and last, to recommend alternative AQM schemes. To begin with first consideration of a simple sender–receiver connection passing through a bottleneck router as shown in Fig. 1. 1

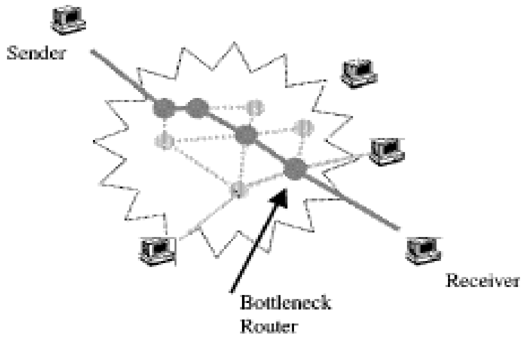

Fig 1.1 A simple sender–receiver connection

Schematic of Fig. 1.2, In TCP so many data packets are lost with increase of rate in available bandwidth for a sender in a network.

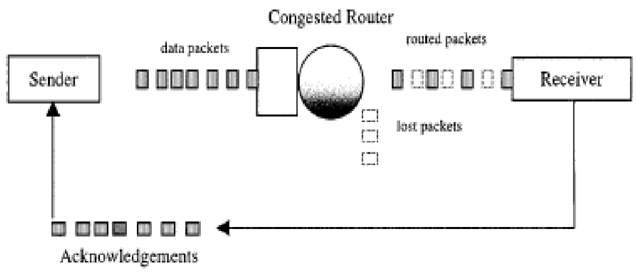

Fig. 1.2 A schematic of a sender–receiver connection

With the loss of packet, the receiver gives signal the sender to reduce its rate. There are few drawbacks with this packet-dropping Scheme which include performance degradation and flow-synchronization due to excessive restarts and time-outs. RED scheme is introduced in many areas for reducing the error which exactly come from the difference between true state and estimated state. One of the example is shown in figure. There are a lot of ineffective for communicating between receiver and sender. Where the data lost is common now a days but by this approach the estimated packet loss can also be counted so that sender get alert from the damage. in Fig. 1.3 RED achieves this feedback indirectly by randomly dropping/marking packets and routing them to the receiver the receiver since TCP is an end-to-end protocol. Which then completes the feedback by acknowledging the receipt of marked packets to the sender, where we emphasize the delayed, implicit, 3 feeding-back of acknowledgment packets. After get receipt of such acknowledgments, the sender increases or decreases its rate according to the TCP algorithm.

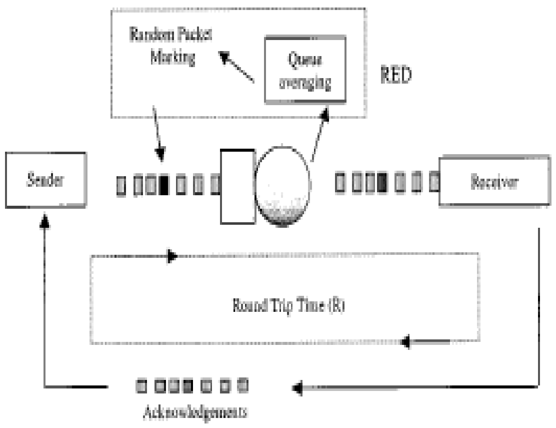

Fig 1.3 RED randomly marks packets to anticipate congestion.

2. LTERATURE REVIEW

C. V. HOLLOT et al. [1] In this paper author introduce an approach called RED scheme which allows the routers to act promptly by the help of measurement of throttling and senders' queue rate. Which in turn affect directly to the network performance. Autor wants to reduce the error rate with using the method to reduce the degradation of performance..

JIHOON YANG et al. [2] In this paper LQ-Servo controller for congestion control in TCP/AQM wireless networks environment are used with comaprision using previously developed controller. A wireless networks link, which is time-varying, has a capacity. For this, it is modeled by three-state mode for considering the dynamics of wireless links in this paper. And the proposed controller structure is made by augmenting a new state variable to the feed-forward loop.

VISHAL MISRA ET AL. [3]In this paper A study of prior developed linear model of TCP and AQM. Author use classical control system techniques to develop controllers suited well for the application. The controllers have shown a better theoretical properties than the well known RED controller. Author present a guidelines for designing a stable controllers subject to network parameters like propagation delay ,load level, etc. Author also give a simple implementation techniques which has a minimal change to RED implementations. The performance of the controllers is verified and compared with RED using network simulations tool. The second goal of authors designs, the (PI) Proportional Integral controller is shown out perform RED significantly.

YIFEI YANG ET AL.[4] This paper gives a enhance algorithm for computing robust PID controller that gives stability region on the parameter planes: ($k\,p$, $k\,I$), ($k\,p$, $k\,d$) and ($k\,I$, $k\,d$) plane. Methodology is based on the D-partition and boundary cross theorem, Author can select any of PID parameters that satisfy robust performance constraint in the stability region that can be obtained by calculating the real and imaginary parts of the characteristic equated to zero. The method is vey simple and can be used in control systems with time-delay, it possess practical use and reference value.

XING ZHU, YENG CHAI SOH AND LIHUA XIE ET AL. [5] In this paper, author gives a solution to the problem of finite And infinite horizon robust KALMAN filtering for uncertain discrete-time systems. Paper's necessary and sufficient conditions to the design of robust filters can be drawn . Through numerical example results of this paper are demonstrated.

ZIDONG WANG ET AL. [6] This paper, Author has studied the robust filtering problem for linear uncertain discrete time-delay systems with MARKOVIAN jump parameters. The system is under consideration and is subjected to time-varying norm-bounded parameter uncertainties, time-delay in the state, and MARKOVIAN jump parameters in whole system matrices. A guarantee is given is to designed a filter to that the dynamics of the estimation error is stochastically stable in the mean square terms, irrespective of the admissible uncertainties as well as the Time delay. The Matlab simulation numerical results imply that the desired goal is well achieved.

LIHUA XIE,YENG CHAI SOH AND CARLOS E. DE SOUZA ET AL. [7] In this author have considered a robust KALMAN filtering problem for uncertain discrete-time systems with norm-bounded parameter uncertainty. The filter is required to provide a filtering error variance which is guaranteed to be within a certain bound irrespective of the parameter uncertainty. I t has been shown that a solution to this robust filtering problem is related to two algebraic RICCATI equations

M.S.MAHMOUD ,L.XIE AND Y.C.SOH et al.[8] Author had developed a robust KALMAN filter for a class with constant state delay of uncertain systems. Time varying and steady-state KALMAN filtering algorithms both have been treated successfully and has been proven that the both filter design amounts to solving two RICCATI equations which involve scaling parameters . Most importantly properties of the proposed filter have been revealed. A numerical example has been provided to illustrate the theory..

objective

Main objectives are to configure a router which work is to hold the packets pf data when an interface is exist. As we know that about the queue if it is short in size the the required data packets to be hold drop of data packets in result. Active queue disciplines drop or mark packets before the queue is full. To reduce the drop problem we need to find the approach which can be able to not even breaks the packets drop but also augment the performance of communication. TCP will play an important role in our thesis that will provide us to use the different protocols to achieve our goal.

3. METHODOLOGY

Block KALMAN Filter (KF) is a numerical method used to track a time-varying signal in the presence of noise. It is the problem of estimating the instantaneous state of a linear system from a measurement of outputs that are linear combinations of the states but corrupted with Gaussian white noise. The resulting estimator is statically optimal with respect to a quadratic function of estimation error.

From the mathematical point view, the KF is a set of equations that provides an efficient recursive computational solution of the linear estimation problem. The filter is very powerful in several aspects. It can be suitably used to either of smoothening, estimating or predicting respectively the past, the present and the future states. This may be achieved even when precise characteristics of the modeled system are unknown, i.e., the case of uncertain systems. The KF is an extremely effective and versatile procedure for combining noisy sensor outputs to estimate the state of the system with uncertain dynamics. When applied to a physical system, the observer or filter will be under the influence of two noise sources: (i) Process noise, (ii) Measurement noise.

The estimate of the state is specified by its conditional probability density function. The purpose of a filter is to compute the state estimate, while an optimal filter minimizes the spread of the estimation error probability density. A recursive optimal filter propagates the conditional probability density function from one sampling instant to the next, keeping in view the system dynamics and inputs, and it incorporates measurements and measurement error statistics in the estimate. Therefore, the recursive generation of the mean and covariance in finite time can be expressed as the following five steps: (i) State estimate extrapolation (Propagation), (ii) Covariance estimation extrapolation (Propagation), (iii) Filter gain computation, (iv)State estimate update, (v) Covariance estimate update.

We use a KF to estimate the state $x_k \in \Re^n$ of a discrete time controlled system. The system is described by a linear stochastic difference equation.

1) $$x_{k+1} = Ax_k + Bw_k \quad (0.1)$$

2) $$y_k = Cx_k + v_k \quad (0.2)$$

Where, $x_k \in \Re^n$ is the system state, $y_k \in \Re^m$ is the measured output, $w_k \in \Re^q$ is the process noise, $v_k \in \Re^p$ is the measurement noise. In the following v_k and w_k will be regarded as zero mean, uncorrelated white noise sequence with covariance R_k and Q_k .

3) $$v_k = N(0, R_k) \quad (0.3)$$

4) $$w_k = N(0, Q_k). \quad (0.4)$$

The matrix $A \in \Re^{n\times n}$ in the difference Equation(0.1) is the dynamics matrix which relates the sate at time step k to the sate at time step $k+1$. The matrix $B \in \Re^{n\times 1}$ called noise matrix. The matrix $C \in \Re^{m\times m}$ in the measurement Equation (0.2) relates the state measurement y_k.When the measurement error covariance R_k approaches zero, the weighting by K_f lets the actual measurement y_k be "trusted" more and more, while the predicted measurement $C_k\hat{x}_k^-$ is trusted less and less. On the other hand, the actual measurement y_k is trusted less and less as the a priori estimate error covariance P_k^- approaches zero, and the predicted measurement $C_k\hat{x}_k^-$ is trusted more and more.

5) The KF algorithm can be seen as a form of feedback estimation. The set of the KF equation can be separated in two groups :

1. Time update equations
2. Measurement update equation

The time update equations project the current state and the error covariance estimates forward in the time to obtain a priori estimates for the next time step. The measurement update equations handle the feedback. In other words, it incorporates a new measurement into the a priori estimate to obtain a corrected a posterior estimate. Therefore the time update equations are predicator equations, and the measurement update equations are corrector equations. That is, the KF is a predictor-corrector algorithm to provide a recursive solution to the discrete time linear system.

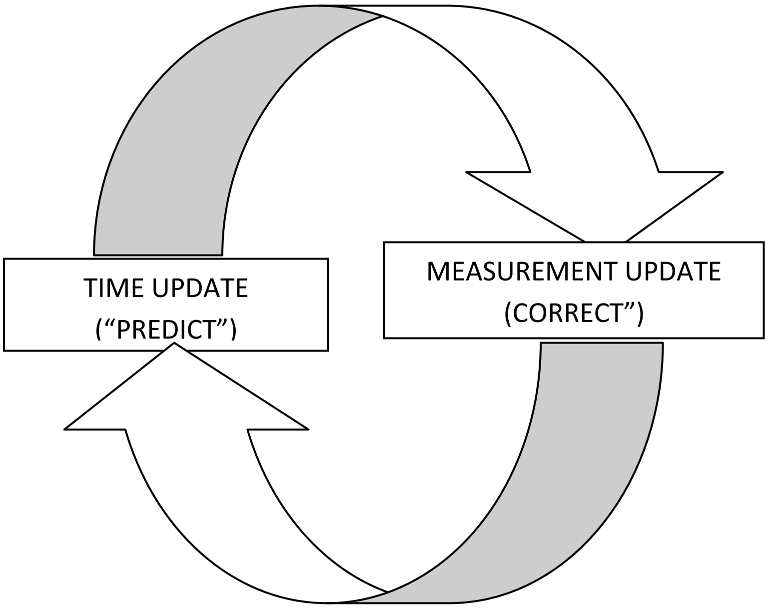

Fig .1.4: Discrete KALMAN Filter Cycle

The time and measurement update equations are presented below:

The time updates equations:

6) $$\hat{x}_{k+1}^- = A\hat{x}_k + Bu_k \quad (0.5)$$

7) $$P_{k+1}^- = AP_k A_k^T + Q_k \quad (0.6)$$

The measurements update equations:

8) $$K_f = P_k^- C_k^T \left(C_k P_k^- C_k^Y + R_k\right)^{-1} \quad (0.7)$$

9) $$\hat{x}_k = \hat{x}_k + K_f \left(y_k - C_k \hat{x}_k^-\right) \quad (0.8)$$

10) $$P_k = \left(I - K_f C_k\right) P_k^- \quad (0.9)$$

The time-update equation projects the state estimate and covariance from time step k to step $k+1$. To compute the KALMAN Gain (KG) K_f is the first job in the measurement update equations. Den y_k is obtained by actual measurement of the system. Incorporating the actual measurement and the estimated one in equation(0.7), we generate a posterior estimate. The last step is to compute a posterior error covariance. This is the recursive operation of the KF. A complete picture of the operation of the KF is illustrated in Fig.4.2, after each time and measurement update pair, the recursive algorithm is repeated with the previous a posterior estimates to predict the new a priori estimates. This recursive nature is the biggest advantage of the KF. This makes the practical implementation of the KF much easier and feasible then the implementation of the Wiener filter, because the Weiner filter obtains its estimates by using all of the precedent data directly. In contrast, the KF only uses the immediately previous data to predict the current states .The standard KF algorithm is shown in Fig.

TIME UPDATE

1) project the state ahead

$$\hat{x}_{k+1}^- = A\hat{x}_k + Bu_k$$

2) Project the error covariance ahead

$$P_{k+1}^- = AP_k A_k^T + Q_k$$

MEASUREMENT UPDATE

Compute the KALMAN gain

$$K_f = P_k^- C_k^T \left(C_k P_k^- C_k^Y + R_k\right)$$

Update estimate with measurement y_k

$$\hat{x}_k = \hat{x}_k + K_f \left(y_k - C_k \hat{x}_k^-\right)$$

Update the error covariance

$$P_k = \left(I - K_f C_k\right) P_k^-$$

4. RESULT

We apply the various input data in out methodology and output comes in form of plot where graph between true state and estimated state.

Simulation Result of Kalman Filter

1) KF Verification on matlab Fig. 1.5 shows the estimated states by KF and true state of a system which is considered. And we observe from the Fig. that estimated state is nearly equal to true state with some error.

When Delta = 0

In result one at figure 1:-

Blue line represent the estimated state and red line represented true state. We can see the difference on those lines-

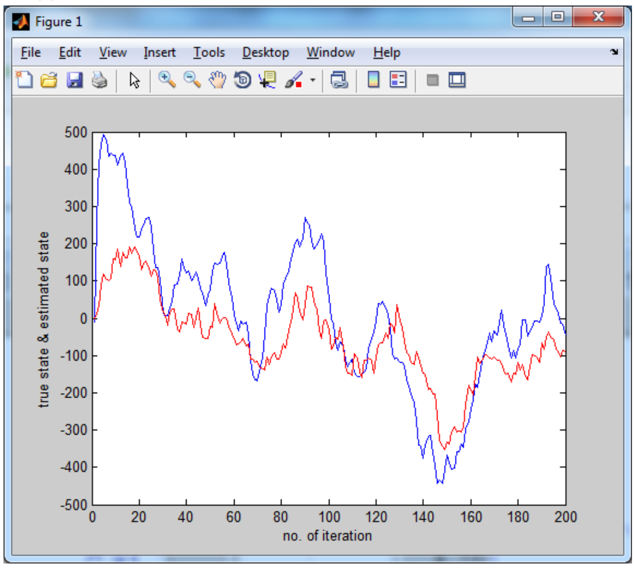

Figure15.:No. Of Iteration Vs. True State And Estimated State(With Difference)

Result 2:- In figure 1.6 It can be seen that there is some difference bewteen estimated line and true line on given graph.
Error = Estimated State – True State

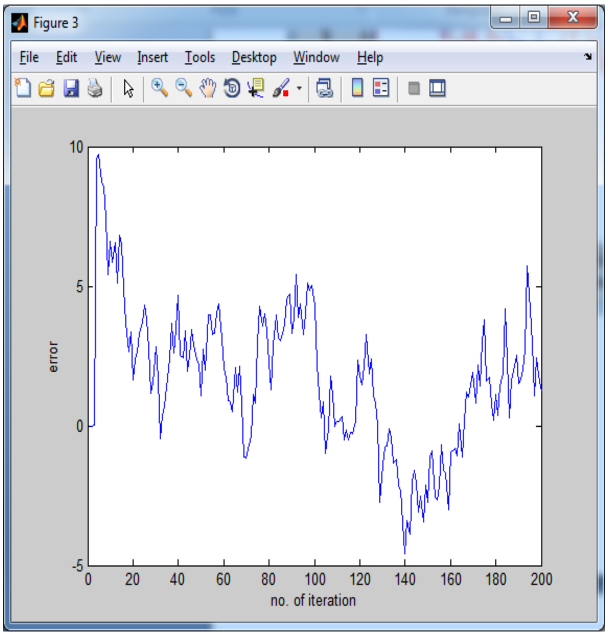

Figure1.6: No. Of Iteration Vs. Error

Result 3:- In result 3 our methodology proves that the estimated state and the true state goes parallels which means the estimation we are projected would be approximately accurate:-

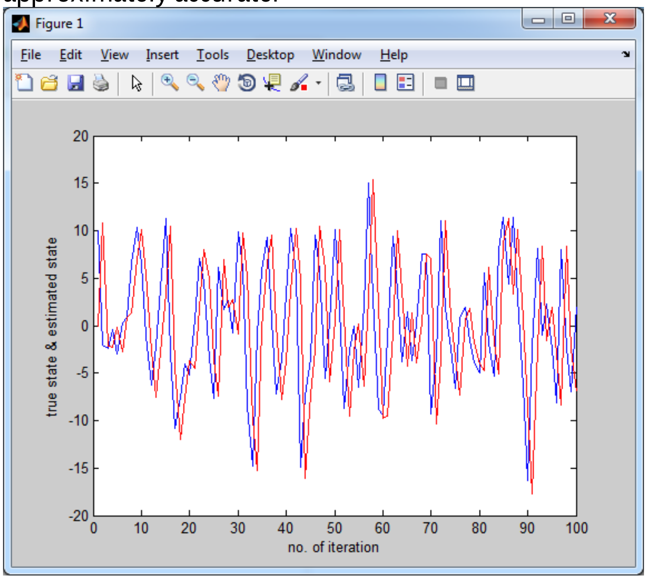

Figure1.7: No. Of Iteration Vs. True State And Estimated State

5. CONCLUSION

In this thesis investigation is done for performance of Kalman Filter. Papers mainly emphasizes the main point of the theoretical and practical work performed during this work and infer conclusions that can be opted from the result. Along this research, one of the application of Kalman Filter has been used as approach.

Initially we implement the KF to a nominal discrete-time system and applied that in the absence of uncertainty and delay the KF works adquately, and the satisfactory result has found for covariance of error in the estimation of true state.

Under noisy output measurements KF is powerful tool to estimate states of a system. In this work, a formulation has been shown for the design of KF for linear system without considering the time delay and used basic ideas on KF. Estimation, prediction & reduction of error the KF performance is also satisfactory. The KF is the most widely used filter for its batter performance so we also used it as important key in our work.

REFERENCES

[1] yifei yang, huangqiu zhu," robust stability regions of pid parameters for uncertainty systems with time delay using d-partition technique", journal of computational information system 9: 20.

[2] d.e.catlin, "estimation control and the discrete kalman filter", springer, new york (2011)

[3] liao, b and zhang, z.g, chan s.c, "a new robust kalman filter-based subspace tracking algorithm in an impulsive noise environment", volume: 57, issue: 9, ieee transaction (2010).

[4] c.v. hollot, vishal misra, don towsley and wei-bo gong," on designing improved controllers for aqm routers supporting tcp flows", to appear in ieee infocom 2001.

[5] c. v. hollot ,vishal misra, donald towsley and weibo gong," analysis and design of controllers for aqm routers supporting tcp flows in pid controller", ieee transactions on automatic control, vol. 47, no. 6, june 2002.

[6] mohamed, s.m.k and nahavandi.s, "robust finite-horizon kalman filtering for uncertain discrete-time systems", ieee proceeding on automatic control, volume: 57, issue: 6page(s): 1548 – 1552(2012).

[7] chen, b. and yu,l;zhang," robust kalman filtering for uncertain state delay systems with random observation delays and missing measurements", ieee proceeding on control theory application, volume: 5 ,issue: 17 ,page(s): 1945 – 1954(2011).

[8] jihoon yang1, dongkyun lim2 and wongeun oh3," lq-servo congestion control for tcp/aqm system in wireless network environment", international journal of control and automation vol. 6, no. 3, june, 2013.

[9] x. zhu, y. c. soh, and l. xie, "robust kalman filters design for discrete time-delay systems," circuits system., signal process., vol. 21, no. 3, pp.319–335, 2002.

[10] x. zhu, y. c. soh, l. xie, "design and analysis of discrete-time robust kalman filter", volume 38, pp-1069-1077, (2002).
[11] m. s. mahmoud, l. xie, and y. c. soh, "robust kalman filtering for discrete state-delay systems", ieee proceeding on control theory application, volume 147, pp-613–618, (2000).
[12] rodrigo fontes souto and joao yoshiyuki ishihara, "robust kalman filter for discrete-time system's with correlated noise", ajaccio, france, 2008.
[13] z.wang, j.lam and x.liu, "robust kalman filtering for discrete-time markovian jump delay system", ieee signal processing letters, volume 11, pp- 659-662 (2004).
[14] x.lu, h.zhang and w.wang, "kalman filtering for multiple time delay system", *automatica, volume 41,pp- 1455-1461 (2005).*
[15] i. r. petersen, a. v. savkin, "*robust kalman filtering for signaling and system with large uncertainties*", birkhauser boston, new york, (2007).

