SD Model of Romeo and Juliet
－SD modeling of literature (2)－

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Abstract

  Adaptation of SD mainly focuses on management and environment aspects, and successes to get enormous reputations from results. However, adaptation of SD is not limited on these areas, but disseminating to psychology and military science recently. Author believes such adaptation should be wider to other fields too. Continuous of such adaptation, this paper tries to build SD model for study literature with quantitative explanation and understanding. William Shakespeare's "Tragedy of Romeo and Juliet" is one of best works in his early age. Similar story also looked in other literatures in other countries including works of Chikamatsu Monzaemon in Japan and opera Tristan and Isère. Added more, "Romeo and Juliet" was adapted to other forms of arts and literatures including Broadway musical "West Side Story".

  However, adaptation of SD to literature is not so easy, specially literatures these focus winding nature of people such as "Macbeth" and "Othello", in later works of Shakespeare, or describes people's behavior on rational environment in works of Kafka and Murakami Haruki. SD Modeling of "Romeo and Juliet" is comparatively easy for avoid consideration of such difficulty, as author find. In this paper, author also discusses technical issues and way of thinking for modeling literature.

Key Words: Shakespeare, Romeo and Juliet, West Side Story

1. Objective

   Author understanding application of SD studies mostly success to management and environment issue and not much for history and literature. However, interesting study for applies to psychology and military study encourage for adaptation to history and literature areas. This study considers how and what may possible for literature study using SD model, or on process of SD modeling. Tragedy of Romeo and Julie [1] is one of most popular play by William Shakespeare. Since this tragedy may sympathetic theme by many people, such story of forbidden love could be found in many literatures in many other countries. Story is always same as young man and woman falls into forbidden love and select suicide lastly. For example, Opera Tristan and Isère and puppet theatre play Sonezaki Shinju by Monzaemon Chikamatsu [2] is typical tragedy almost same story with Romeo and Juliet and this is not last. Added more, story of Romeo and Juliet is rewrite into different situation and style, such as adapted to modern urban society in New York, USA in West Side Story [3], or modern times of America in movie "Romeo + Juliet", 1996. Even composer Protokofiev makes ballet "Romeo and Juliet". Remaking this story still continued.

   Before adaptation of this literature, author also tries to make SD model for other literatures, mostly plays, and faces with difficulty on describe winding nature of people in the play, such as Macbeth, Othello and Richard III, these are also works of Shakespeare. Also adaptation is very difficult to modern literature in the world of surrealism, such as Franz Kafka's "Die Verwandlung (Metamorphoses)" and his other works, as well as series of works by Haruki Murakami. Among those attempts, modeling of "Romeo and Juliet" is easiest. Also modeling of play is relatively easy than modeling of novel.

   In this paper, author want to discuss technique for modeling literature and also shows how and what would be difference among literature of similar story, for case of musical West Side Story.

(1) Big picture and small picture regarding scope of work

  It may exists some misunderstanding to author's attempt for apply Systems Thinking and System Dynamics methodology to modeling literature. Some critical comments insist this paper does not answer to classical questions on literature, that may topics continuously discussing and arguing for

more than centuries. Author does not intend to answer to these questions on literature studies nor adapt classical approach of literature criticism or literature theory, that would be including widely accepted meaning of literature gives depth understanding of human nature, or chance to consider what is human being, what is meaning of life, or how author of literature thinking and tries to show his/her idea to reader?. This is paper of ST and SD, but surely not paper for discuss such classical literature arguments.

Rather, author tries to attempt what ST and SD may possible for help to understanding literature, or more precisely what modeling and simulation gives depth understanding of literature works. But this is too big picture for author. Challenging to this theme is like ask to climb Mount Everest to beginner. Therefore, author try to limits ST and SD approach may possible to literature, focuses on Shakespeare's Romeo and Juliet, as first step.

Author knows understanding literature is not requires quantitative approach. Normally reader uses their intuition and that may sufficient. But if, ST and SD style qualitative and quantitative approach are existed, is it make different? That is what author tries to answer even in limited of Shakespeare's Romeo and Juliet. However, this is not hypothesis requested to prove in this paper.

(2) Psychological approach

Second misunderstanding is not use psychological approach on this paper for determines character of the people in this play. However, author has different opinion and do not think it is necessary to understanding literature limited on Shakespeare's "Romeo and Juliet". Psychological analysis of character setting may help to understanding psychology of people in the literature, though not gives full understanding what is true nature of human being on the literature, or structure of the literature. That is what author understating. Again, this paper is not attempt to argue about phycology of people in the literature. This paper is more try to understanding structure of literature.

Author could find people in the literature behave and think quite rational, at least people in the play Romeo and Juliet. In such situation, games theory can more adequately explain their judgment and behavior, though it would be limited for people in the play, "Romeo and Juliet". Further study may necessary for how to handle winded nature of the people in other literature. In that case, may be psychological approach may necessary.

(3) K12

This paper is not aims to argue K12 education. Author does not intend to argue quantitative approach is necessary for CLE. CLE has their approach. Also, author does not intend to insist the approach in this paper could applicable to K12 education, including English class. This paper simply aims what if ST and SD may apply to modeling the literature work including Romeo and Juliet, and West Side Story. Also, author do not insists English teacher can master ST and SD techniques mentioned in this paper for his/her class.

2. Approach, hypothesis, assumption and method of testify
(1) Approach
1) Evolving SD Model

Author use evolving SD model for explain the story of the tragedy. Evolving model means, first prepare baseline model, mostly explain background of the story (model 1 and model 4). Then add new loop, or new connection based on events emerged in the story. Story explained with newly added loop, or newly added connection, or shifting of main loop. For this play, using event chain reaction loop for explain the passage to lead to the tragedy. In this paper, model evolving from model 1 to 2 and 3 (qualitative modeling), or model 4 to 5 and 6 (quantitative model).

2) Scaling

Author also adapts games theory for reason why people in the play behave. The model assumes people in the play behave based on value of expected gain, compare profit, and select behavior. For example, compare expected gain in action 1 and action 2, and if gain in action 1 provides +3 instead only gain is +1 by action 2, this person chooses action 1 after compare expected gains from two actions. Also assumes zero sum game situations for conflict of two competitors.

For motivating behavior of people in the play, author introduces sense of value and designed people in the play motivated by this sense of value in those days.

For describes emotion of people in the play quantitatively, author introduces scale measures by psychological evaluation, as "hate" represent -5, "interest with dislike" is -3, "no interest" is 0, "like" is +3 and "love" is +5.

3) Comparison with similar story

Utilizing these technologies, author first focus on modeling of "Romeo and Juliet" and try to explain why two lovers (Romeo and Juliet) increasing forbidden love and select suicide as the end with SD model and simulation. Tragedy of Romeo and Juliet adapted to modern day in New York, USA in musical "West Side Story". Author also tries to explain what is different with two stories, even though stories looked to have highly similarity. Actually, similar story of such tragedy of forbidden love could be found on many literature including Tristan and Isere but not analyzed difference of their structure, as author's opinion.

It may say comparatively easy to developing SD model for management or environment aspects for existence of measureable quantitative data. But there is not measurable quantitative data in literature and art. Added more, wired and unreasonable behavior is actually quite reasonable from stand by hero or heroine in the literature, however it may hardly difficult to explain logically to other people. Normally, reader can understand reasonability of character or behavior through sympathy with hero or heroine by understanding their circumstance, but not using measureable data, and basically there is not such data.

4) Motivation of behavior for people in the play

In applied psychological study, there is several method and tools to measure behavior of people or judge their character, such as Mayer Brigg Type Indicators. There are also published some books explains character of literature and categorized in types, however, non of them is useful to build the SD model in this paper. Thus author does not use their psychological views, approaches and technologies of those.

In this paper, author use game theory for describe reason why people in the play do such behavior as well as value of people in 16th century.
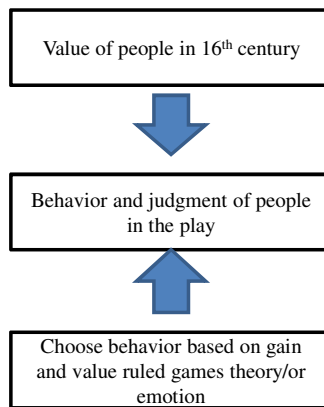

Fig. 1: motivation of behavior for people in the play

People in the play are motivated with value of 16th century when Shakespeare writes this play, specially people in the noble society. Romeo, Juliet and other family members of the Montagues and the Caplets behave based on the value of this 16th century. However, if situation is change, for example, in West Side Story, motivating to behavior is not same. This could be crucial point for understand why people in the play take such action. Explain detail later, but setting this "value of people in 16th century" make clear understanding why Juliet insists marriage to Romeo when she

accept his confess of love, or why Mercutio buys fight for Romeo from Tybolt.

Also, people in the play behave based on calculation of value of gain, calculated by games theory. For example, Nurse changes her attitudes to Juliet after Act 3 Scene 5. Before, she acts very devotedly to Juliet and support marriage with Rome. But in Act 3 Scene 5, she advises to Juliet to betraying Romeo. Games theory can explain well for such behavior.

Table-1: example of value and gain by games theory (in Romeo and Juliet)

View of Nurse	Gain/loss for continuous supporting love of Juliet to Romeo	Gain/loss for not supporting love of Juliet to Romeo
Romeo is not criminal (before Act 3 Scene 5), Juliet loves her, and also she loves Juliet.	+5 (she can keep job, food and shelter, good position in the Caplets as well as Juliet keep relay on her while she support Juliet and could keep maintaining love of Juliet)	-3 (if Juliet does not like her anymore, she may lose her job and good position in the Caplets)
Romeo becomes criminal (after Act 3 Scene 5).	-3 (she would be fired by anger of Load Caplet, if she keep Juliet's side and supporting marriage of Juliet and Romeo)	+3 (she may keep her job and shelter, if Juliet married with Count Paris, though Juliet may not relay on her so much and she may not in good position in the Caplets)

(2) Hypothesis of the paper
In this paper, author wants to show modeling is possible for Shakespeare's Romeo and Juliet. And testify would be achieved with developed model and result of simulation.

(3) Validation of the model
Dr. Hironori Matsumoto categorized SD model into three categories, 1) qualitative mode, 2) non rigorous quantitative model for analysis of trend and 3) rigorous model for accurate projection. Model in this paper categorize into 2). Thus, some reader may impressed model is not perfect, and something missing, but author believes model is sufficient if all necessary functions are contained on the model and possible to do sufficient simulation. It may be impossible to developing rigorous model explains characters of persons in literatures or histories, nor intend to develop such rigorous model in this paper.
For validation of the model, confirms:
- All events are covered in the model
- All characters are described as determination
- People in the play behave as story

Professor John Morecroft categorized SD model for 4) model for understanding nature and 5) model for project future. Model in this paper categorized into 4) and not consider validation with model is predictable or not. Also, validation use model can applicable with similar situation, as one of common techniques. This method may acceptable for social science fields, however, author find similar story is not always sufficient for using validation of the SD model in case of literature. This issue may argue in later but just mentions this paper does not take this approach for validation of the SD model. At this moment, author does not know what could be replaceable validation technology for this issue. At this moment, author just wish to point out similar story literature may not always same structure and could explain same model. Even existence of highly similarity on the story of two literature works, it may different structure.

3. SD model of other literature
There is quite small number of SD models target to literature works. Professor John Morecroft explains SD model of Romeo and Juliet in his paper [4], but this model is rather conceptual one explains behavior focus only two lovers, Romeo and Juliet. Author could not find other SD model for explain "Romeo and Juliet". Pamela Lee Hopkins presents excellent SD model in her paper on

"Simulating Hamlet in the classroom" [5]. This model was further considered and confirmed sufficiency by Tim Haslett on his paper "Simulating Hamlet: a critique" [6].

Author finds several teaching material on literature for K-12 on HP of CLE: Creative Leaning Exchange, but all model is qualitative or limited in Systems Thinking, for example "Animal Farm" [7]. These are no other SD models author can find quantitative or qualitative, for literature study or teaching literature using ST or SD. Author wonders why so small number of SD model for adapting literature, and concluded difficulty on techniques and discourage by so few studies may make some psychological barrier for develop SD model in literature world.

4. About Shakespeare's "Romeo and Juliet"

There is no record on when "Romeo and Juliet" was played first on theatre, however, assumed before 1595 by evidence of First Quarto, pirate version of the play was published in 1597 and topics on the play was happen before 1994. In 1599, Second Quarto, Shakespeare himself write was published. In 1623, after death of Shakespeare, First Folio, collection of his all works published. These 3 publishing are basis of Shakespeare's play including "Romeo and Juliet", according Folger Shakespeare Library [1]. However, English in these original publishing are different with modern English. Literature [1] considers these 3 originals as bases of Shakespeare's play and rewrite (or more precisely translates) to modern English. Since author cannot understand 16th century English, this paper bases on this translated into modern English version.

(1) Story as determination describes with the model

Outline of "Romeo and Juliet" is as follows, briefly (for readers whom may not know the story). Two powered families, the Montagues and the Capulets in 14th century Italian city Verona, are in conflict and sworn enemies. Scene starts street-fighting of two families. Prince Escalus, whom ruling Verona, prohibits fighting and declares that further breach of the peace will be punishable by death (up to Act 1 Scene 4 and scope for model 1 and 4).

Count Paris, a kinsman of Escalus wishes to marry Juliet but Load Capulet is wary of his request as Juliet is still thirteen, but invites him to ball in his house.

Meanwhile, Benvolio, cousin of Romeo, discovers that Romeo's disperses comes from imaginable love for a girl named Rosaline, one of Capulet's nieces. Persuaded by Benvolio and Mercutio, Romeo snakes into the ball at the Capulet house in hopes to see Rosaline. However, Romeo instead meets and falls in love with Juliet. After the ball, Romeo could not stop but sneaks into courtyard of the Capulets and overhears Juliet on her balcony confesses her love to him. Romeo makes himself known to her and Juliet asks him to agree to be married. With the help of Friar Laurence, who hopes to reconcile the two families through their children's union, they are secretly married the next day by assistance of Juliet's nurse (up to Act 2, Scene 6 and scope for model 2 and 5).

Juliet's cousin Tybalt, finds Romeo sneaked into ball of the Capulets and angry to Romeo, but Load Capulet stops him for avoid trouble in the ball. Next day when Romeo backs from the secret marriage with Juliet, Tybalt finds him on the street and challenges him to a duel. Romeo, now considering Tybalt as cousin in law, refuses to fight. Mercutio is offended by Tybalt's challenge, as Romeo's refuses assumes dishonor behavior and accepts challenge on Romeo's behalf. Mercutio is seriously wounded and die when Romeo try to stop the fight. With guilt and anger, Romeo confronts and happens to kills Tybalt.

The Prince exiles Romeo from Verona. But Romeo can secretly spend the night with Juliet before leaves from Verona.

Load Capulet, misunderstanding Juliet's grief as losing of her cousin, and insists her to marry with Count Paris. Added on this situation, her mother and even the nurse insist marriage with Count Paris.

Juliet visits Friar Laurence for help, and he offers her a drug that will put her into a death-like coma for "two and forty hours and after wake from coma, suggest to running away from Verona". The Friar promises to send a messenger to inform Romeo about the plan, for he can rejoin her when she awakens. On the night before the wedding, she takes the drug and, when discovered apparently dead, she is carried and laid in the family crypt.

However, the messenger does not reach Romeo. Instead, he finds Juliet's death (apparent death) from his servant Balthasar who watching Juliet in Verona for Romeo. Romeo's heart broken, and passion to buys poison and rush to the crypt of the Capulet. When he comes to the crypt, he encounters Paris who has come to mourn Juliet privately. Paris believing Romeo to be a vandal, and confronts him but Romeo kills Paris in the battle. Then he drinks the poison and suicides beside the body of Juliet. When Juliet awakens, finding Romeo's dead body, and follow him stabs herself with his dagger. The two families and the Prince come to the tomb and find all three dead. Friar Laurence told what happen and two families decide to reconcile for their children's deaths and agree to end their violent feud relation (up to end of this play and scope for model 3 and 6). This is the flow of the story author aims to describe with SD model.

Summarized, following events in the outline mentioned above should be incorporated into SD model:
1) Modeo1 and 4:
- Conflict of two families

2) Model 2 and 5:
- Romeo and Juliet met at the ball, in Act 1 Scene 5
- Tybalt feels anger to Romeo, in Act 1 Scene 5
- Confess of love, in Act 2 Scene 2
- Nurse's assistance for marriage in Act 2 Scene 4
- Marriage of Romeo and Juliet in Act 2 Scene 6

3) Model 3 and 6:
- Street fighting of Tybalt and Mercutio, Act 3 Scene 1
- Slay of Mercutio in Act 3 Scene 1
- Slay of Tybalt in Act 3 Scene 3
- Exile of Romeo in Act 3 Scene 4
- Command of marriage to Juliet in Act 3 Scene 5
- Treated advise of Nurse in Act 3 Scene 5
- Juliet asks help to Friar Lawrence in Act 4 Scene 1
- News of Juliet's death in Act 5 Scene 1
- Romeo's decision to come to Juliet in Act 5 Scene 3
- Suicide of Romeo in Act 5 Scene 4
- Juliet's decision for follows death of Romeo in Act 5 Scene 4
- Suicide of Juliet in Act 5 Scene 4

5. Characters in the play as determination
Main subject in many literatures including play aims or focus psychological conflict of hero and heroine in the circumstance, and character of them may major driver, but author could not find any winding nature on all characters in the play "Tragedy of Romeo and Juliet". Characters in the play on later work of Shakespeare, such as Othello, Macbeth and Richard III shows more wild and wired characters, such as jealousy in Othello, ambition in Macbeth and Richard III. For example, ambitious of Richard III forces him to battle of war. But when he faces to battle, he scares and tries to escape. Clearly this shows negative nature of human being including weakness, coward, scare and fear, these may not be applauded. Hamlet also shows lack of clear decision making, trapped in psychological conflict, and such weakness and negative character makes sympathy to Hamlet, as author's opinion. Shakespeare success to show clearly such weakness of human nature on his later works and this makes attractiveness of these works. If Shakespeare could not success to show such weakness of human nature on his works, those may not be classic literature, and reader may not have much interest to his work. It would be extreme opinion, however, attractiveness of literature comes from understanding such weakness and negative side of human being, in most case.
However, author has different impression from Romeo and Juliet. Characters of people in this play looked more simple and straight, and even honest. Author could not find any hint of winding and

dishonest nature on characters in this play. Shakespeare does not describe much detail on character of people in the play as well as structure designed simplified, and information on stage direction is limited. If he describes more detail, may be reader can know negative nature of people in the play. There is a slice of hint about character of Lady Capulet, for suspect her strong nature, but not detail information in the description, words and behaviors mentioned in the play.

Author try to modeling for another literature and feel some difficult for describes negative nature and character of people in the literatures, specially who has ill mind and winding nature. Among many experiences, modeling of Romeo and Juliet is one of easy case.

For describe and set to the model, here determines nature and character of the people in the play. Model in this paper based on these determinations:

(1) Romeo: only son of Load and Lady Montagues. People may have some prejudice to male Italian in the literatures or movies, as playboy, and not always honest and faithful to female. However, nature of Romeo looked quite opposite. He looked straight, pure and simple-hearted young man. Because story focus in only one week when he met with Juliet and suicide, there may not enough time for shifting his heart to other attractive female. Author judges his good and pure nature from following aspects. In Act 2, Scene 2, when Juliet asks to Romeo for marriage, Romeo immediately agrees and swears for the God. In Act 3, Scene 1, Romeo tries to avoid challenge from Tybalt and try to stop fighting between Mercutio and Tybalt. In Act 5, when he heard death of Juliet, he rushes to the crypt of the Capulet where Juliet lay. Author determined character of Romeo from such evidence of his word, behavior, and stage directions. The model sets young man who has straight, honest mind and purely loves Juliet for his character.

(2) Juliet: only daughter of Load and Lady Capulet. Juliet also has pure and honest nature but also has realistic and strong wiliness for faith to Romeo. Realistic nature and strength may come from circumstance in Italy, where so many unfaithful playboy (in literature word) surrounding. (Author does not have such prejudice to Italian. But also understand there are such prejudice in literature and topics of so many song, poem, opera, novel and movies.) Author judges her good, pure and strong character from following aspects. In Act 2 Scene 2, when Romeo confesses love to Juliet, she asks him to marry first. In modern world, "If you just want to play with me, I'm not such type of girl. But if you want seriously love with me and consider marriage, we will be steady". Author impresses realistic nature of her from this scene. In Act 4 Scene 1, Juliet visits Friar Laurence for help to avoiding bigamy with Count Paris, and tries to keep faith to Romeo. In Act 5 Scene 3, Juliet immediately suicides without any hesitate when she knows death of Romeo. Based on these words and behaviors of Juliet, the model sets young woman who has straight, honest, but strong nature for her character.

(3) Mercutio: kinsman of Prince Escalus, and a friend of Romeo. Author could not success to find wired nature among other people in the play. Mercutio has nature of humorous and funny guy spreads lot of jokes, however, he is not type of conspire or planning in backside. He looked more manly type and has good friendship with Romeo. In Act 3, Scene 1, when Romeo tries to avoid challenge of Tybalt, Marcutio impressed coward and dishonor to Romeo and accepts challenge of Tybolt on Romeo's behalf. This behavior impresses his kindness, deep friendship to Romeo and his manly-ness. Also impressed his pure and faithful nature, though faithful is not for female, but for Romeo and value in 16th century on noble society.

(4) Tybolt: a cousin of Juliet, and the nephew of Lady Capulet. In modern world, his nature may misunderstood for abnormal, crazy monomania. He is indeed rather strict rational type, though author could not success to find any hint of winding, crazy character for him in the play. In Act 1 Scene 5, Tybolt finds Romeo snaked in the ball and felt insult. That makes him to challenge to Romeo on street fighting in Act 3, Scene 1, and leads his death. But he never tries to assassinating or other sordid method for kill Romeo, and this is the reason author thinks he has also straight nature, basically. He is just too much faithful for honor of the Capulets.

(5) Nurse: Juliet's personal attendant and confidante. She has roles of Mercutio in Juliet side. She plays cupid roles and assists marriage of Romeo and Juliet. She is really loves Juliet, though also very realistic person with old hand, typical character of commons. In Act 2 Scene 4, Nurse comes to visit Romeo for confirm his wiliness and arrange the marriage. But in Act 3 Scene 5, Nurse advises to Juliet for marriage with Count Paris, and forgets Romeo, or unfaith to Romeo, even she knows Juliet deeply loves Romeo and want to faithful to him. From such words and behavior of Nurse, author impressed she has some sort of cleverness of commons, however, could not find any supportive word and behavior of winding ill mind nature.

(6) Load Montague and Lady Montague: parents of Romeo and hate the Capulets. But reason why they hate is not mentioned in the play. It may suspected for conflict on some tax collection right from market, or goods trade right in Verona, but obviously not conflict of ruling right in Verona. Prince Escalus ruling Verona. Conflict of ruling right is reason for Macbeth and Richard III, and this makes very easy to understand the situation, but causes of conflict in Romeo and Juliet is not much clear. In other literature, conflict sometimes caused by just simply dislike somehow, but this is not case. In such literature, basically people in the literature has winding, ill minded crazy nature such as envy or jealousy, and such winding situation growing in the progress of story, but author could not find any hint of words and behavior on such kinds of negative character in the play. In this model, author simply set natures as ordinal parents love their only son deeply.

(7) Load Capulet and Lady Capulet: parents of Juliet and hate the Montagues. Again, reason of their hates is not clear. In the Act 1 Scene 5, while Tybalt angry to Romeo, Load Capulet tries to avoid trouble and stops the behavior of Tybalt. This behavior impressed his basically gentle and peace love nature. For Lady Capulet, she tries to poisoning Romeo in Act 3 Scene 5, for send her murderer to Mantua where Romeo escaped. This word suggests her strong and may be wild nature but unfortunately Shakespeare does not mentions any further. In this model, author simply set natures as they love their only daughter deeply and stop to add any more character.

(8) Others: servingmen and Rosaline are not set any determination on this model. Rosaline, a niece of Load Capulet, is an unseen character and suspected Romeo is dreaming love with her. It may just his one way illusion love, and he forgets her so easily after he met Juliet.

5. Modeling and simulation
(1) Qualitative modeling

Model 1 on figure 2 shows situation of Act 1 from Scene 1 to 4, and describes conflict between the Montagues and the Capulets. This is typical escalation model, as anger and frustration of the Montagues focus to the Capulets, and escalating anger and frustration of the Capulets, that focus to the Montagues and creates another angers, shows as reinforcement loop R1. Prince Escalus's intervention for tries to control works to reduce the heating of escalation and makes growth of reinforcement slower *1). Author evolves further follows act 2 from this SD model.

Model 2 on figure 3 shows situation up to Act 2 Scene 6, and describes how story moves from situation on model 1, in figure 1. Romeo and Juliet happen to meet at the ball of the Capulet and like each other, in Act 1 Scene 5, they fall in love, and their loves increasing through Act 2. Their love is not affected by conflict of two families and loves escalating as the reinforcement loop R2 independently from loop R1. This reinforcement loop (R2) strengthened by help of Nurse and guide of Friar Laurence. The model shows rapid growing reinforcement loop in slow reinforcement loop. Or author wishes to explain the story with add another loop (R2) on model 1.

Model 3 on figure 4 shows qualitative model for describes Act 5, climax of the play, and explained with evolution from models 2 in Figure 3. This model shows interaction between two loops, or author wants to explain story as model 2 evolves to model 3 with interaction, and two event

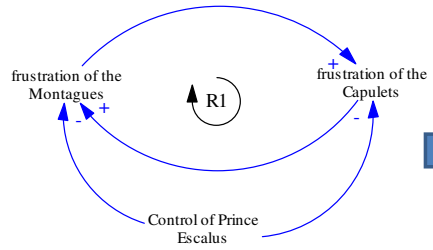chain reaction loops R3 and R4 for explain incidents emerged in Act 3 to 5.

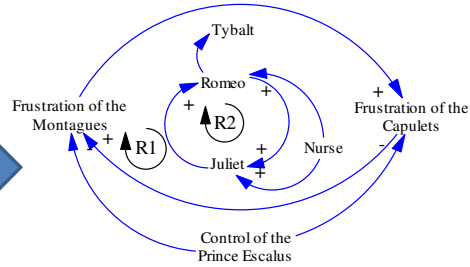Figure 1: Conflicts of two families, in Act 1, Scene 1 to 4

Figure 2 Romeo and Juliet in love, up to Act 2, Scene 6

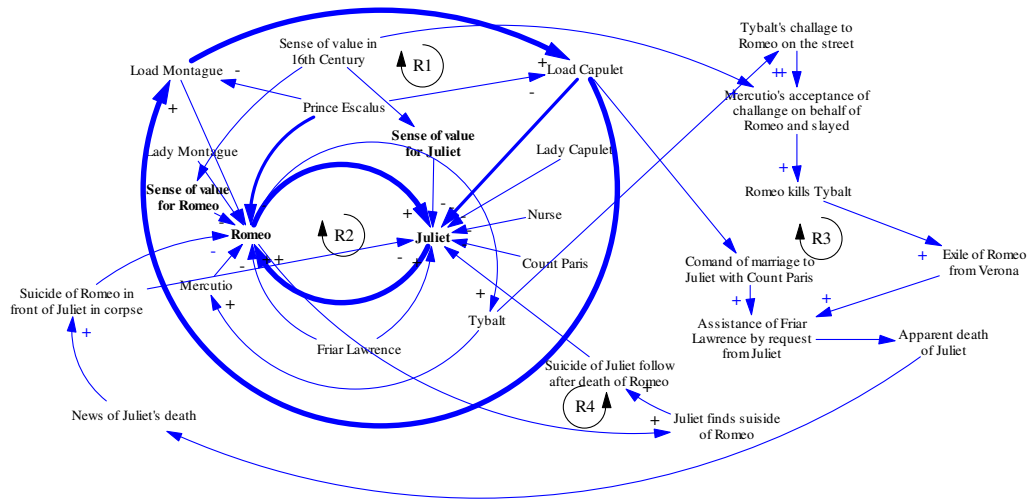Figure 2 (left: model 1) and Figure 3 (right: model 2)

Figure 4: Model 3 for Act 3 to 5

There are so many incidents happen in Act 3, forces to separate love of Romeo and Juliet, and makes tension to audience. Tyabolt challenges to Romeo on street, and Mercutio accepts his challenge on behalf for Romeo, and slayed. This incident leads fighting of Romeo and Tyabolt, and Romeo accidentally kills Tyabolt. Prince Escalus exiles Romeo from Verona for violate his order of peace. Load Capulet commands to Juliet for marry with Count Paris. Nurse's advises Juliet for treat love to Romeo. Only supportive act for relation of Romeo and Juliet is assistance from Friar Laurence. These events are incorporated into the event chain reaction loop R3. It is not mentioned words in the play exactly, however, assumes action of Load and Lady Montague against love of Romeo and Juliet, and set negative impact in the model. Active of Load and Lady Capulet affect negative to Juliet for against marriage with Romeo. It is not sure but suspected Mercutio may against to marriage of Romeo and Juliet and assumes weak negative impact to Romeo. Relation between Romeo and Tyabolt shows positive for escalating hates, as well as relation between Mercutio and Tyablot. Here in this model, author sets positives for escalating these hates.

Two independent loops R1 and R2 in the model 2 now creates event chain reaction loop R3, and leads suicide of Romeo, and then another chain reaction event loop of R4 emerged by the result of reinforcement loop R3. However, basic model structure is not change, or model 3 is just evolved from model 2, and become more complicated.

In this model, author sets sense of values, sense of values in 16th century affects to sense of value for both Romeo and Juliet, as well as Mercutio have, as control factors from higher layer. This concept adapts CLA (Casual Layered Analysis), commonly accepted in futures studies [8], [9], [10] and also lecture of literature in many universities. Author also adapts this concept for study of macro micro linkage models [11].

Sense of values in 16th century is, must faith to others after swear love in front of the God. Of course this would be only affected in Europe in 16th century, and in noble society. Not insist this sense is valuable in commoners, even in 16th century Europe. However, marriage becomes officially formed (affected) for swear love in front of the God and continued for keep the promise to the God. In this sense of value, marriage is effective even done in secret, or not approved by parents, as much as this marriage is done in church and swear to the God. This is the reason why Juliet must feel strong conflict and tries to avoid marriage with Count Paris, even her parents insists and finally command to her, or Nurse advises her. Marriage with other man means betraying to both Romeo and the God. Person who lives in noble society thinks honor is most important value including keep words. This sense of value for marriage would be changed in modern worlds and promise to the God may not have serious meaning anymore.

Second sense of value in 16th century in this model is, manly behavior of males. This means challenge should be accepted whatever it is. Honor of male should be protected with life. This is the reason why Mercutio buy challenge of Tybalt for behalf of Romeo. Mercutio feels luck of courage and dishonor to behavior of Romeo who tries to avoid challenge of Tybalt. Such sense may already be nonsense in modern world. If parameter of this sense of value is changed, model behavior would be different.
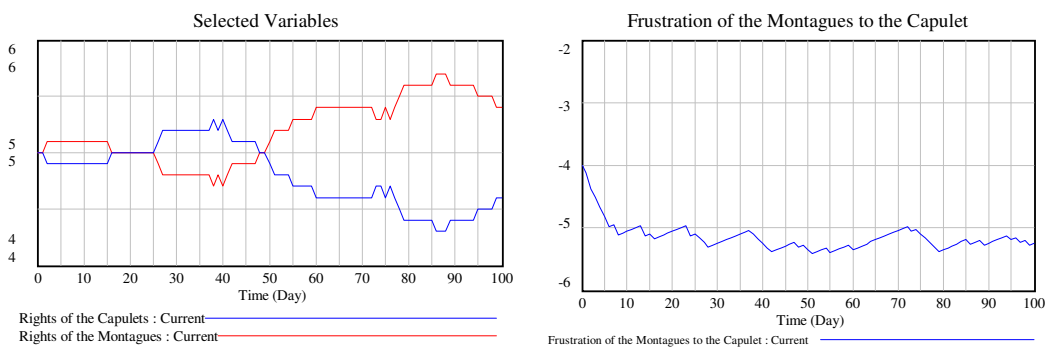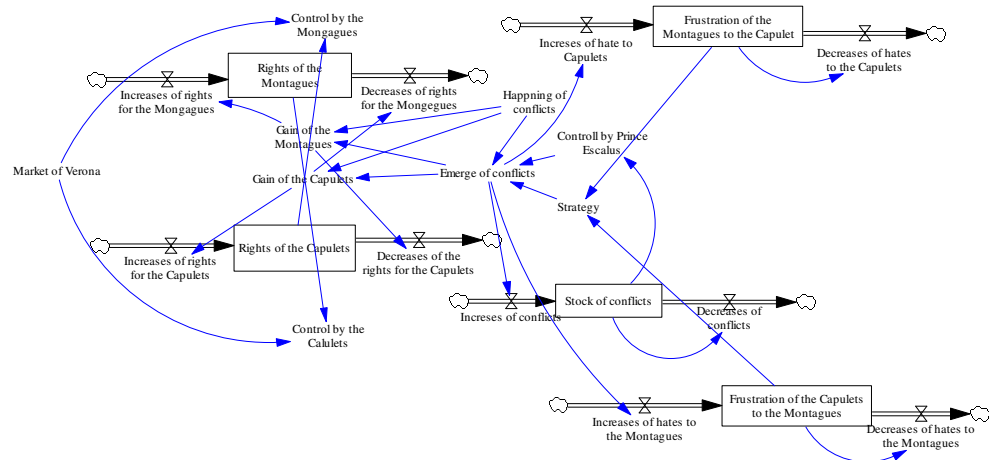
(2) Quantitative model
1) Quantitative model for model 1 and simulation result
Model 4 in figure 5 shows quantitative model for the qualitative model 1, explains conflicted situation of two families in the play up to Act 1 Scene 4 with simulation results. Conflicted situation between two family set based on typical zero sum condition in the games theory. Hates reducing with 30 days while emerge of conflict increases stock of hates. While stock of hate maintaining in minus status, "strategy" is set "hostile attitudes to other". It means while stock of hate stay in minus status, two families will not reconcile. Under this condition, when stock of hate increases more than 10, intervention by Prince Escalus emerge and stop to emerging conflict, though not continues so long. Right side graph in Figure 4 shows frustration of the Montagues to the Capulet. Hates of the Montagues to the Capulets fluctuated between -4 to -5 *2).

While stop the conflicts between two families with intervention by Prince Escalus, market share of each family is not change. However, soon, emerge of new conflict change their market share, though total of market share is always 10.

There would be arguments for this model regarding size of the market. If conflict is increasing, demand of arms would be increasing and supply of arms would be also increasing. But author ignores such arguments regarding expansion of market by trade of arms in this model. This market size is fixed to 10. Again, this market size is not has much meaning. Any size would be acceptable, but just choose 10 for size of the market in this model.

(not show simulation result of frustration the Montagues has to the Capulets because result is same for the frustration of the Montagues to the Capulets)

Figure 5: Quantitative model up to Act 1 Scene 4 (model 4) with simulation results
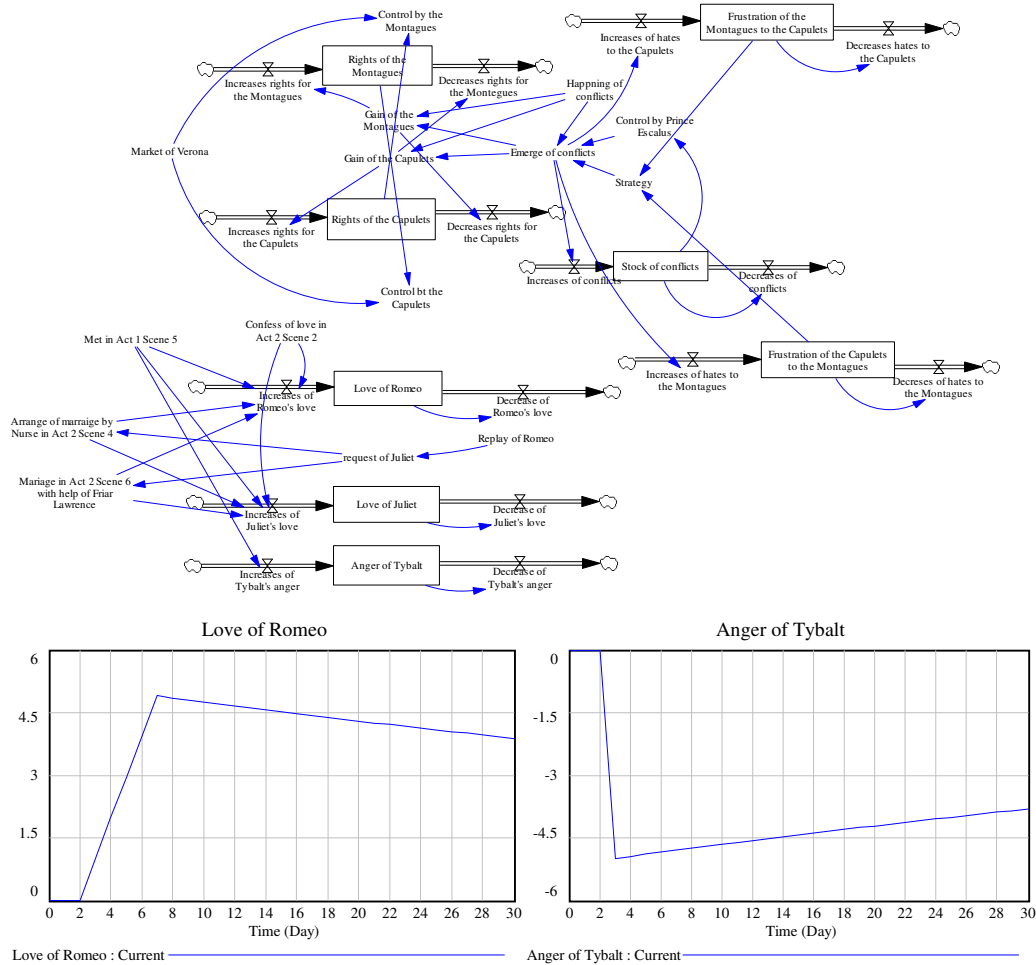
2) Quantitative model for model 2 and simulation result

Model 5 in figure 6 shows quantitative model of model 2, and explains situation in the play up to Act 2 Scene 6. Three stocks are added on model 4 for show emptions of Romeo, Juliet and Tybalt. Their emotion represented from -5 to +5. In Act 1 Scene 5, Rome met Juliet and they like each other. This incident change the emotion parameter of Romeo and Juliet from 0 (initial value) to +1. On the other hand, set -5 to parameter of Tybalt, for he feels strong anger to Romeo.

As following event, in Act 2 Scene 2, Romeo snakes to courtyard in front of balcony and room of Juliet, and happen to know Juliet also falls in love to him. He appears and confesses his love to Juliet. This incident adds +1 to emotion stock parameter (stock) of them ∗3). In this scene, Juliet asks to Romeo for his love is serious. Romeo agrees and simulation moves to assistance of marriage by Nurse in Act 2 Scene 4. Response of Romeo is the key for go forward or stop to next event. If Juliet suspected seriousness of Romeo, increasing of love stops at this point.

Then next event in Act 2 Scene 4 emerged. Nurse visits Romeo for confirm his wiliness. Then in Scene 5, Nurse comes back to Juliet and tells wiliness of Romeo. These events increase one point of their love and their emotion stock reaches +4. In following scene 6, two lovers married and swear love in front of the God, and their emotional stock indicators reach +5. Time reduces their emotion stocks gradually for 100 days. This model set conflict of two families start on day 1, and meet of two lovers set on day 3, marriage set on 5th day. Modifies and extends time a bit longer from original play for clear the dynamism on graph. If set meeting and marriage in two days, model behaves emotion stock indicators jump from zero to +5 in 2 days, although Shakespeare sets so in the play. In

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this sense, scale may translate one day as 12 hours.

(Not show simulation result of Juliet's love because same with Romeo's love)
Figure 6: Quantitative model up to Act 2 Scene 6 (model 5) with simulation results

3) Quantitative model for model 3 and simulation result

Model 6 in figure 7 shows quantitative model of model 3, and explains situation in the play up to climax. Two stocks are added on model 5 for show conflicts of Romeo and Juliet, and introduce two stock indicators for show alive or death of two lovers. Last two stocks are not much means on the model and simulation, but just introduced for show status of alive or death, and no necessary to be stock indicators. Conflict indicators give judgment of action for Romeo and Juliet. If conflict exceeds more than 3, they take action. It may make a bit confuse, and not show that on the graph, but conflict takes negative value in the model for calculation.

In Act 3 Scene 1, Tybalt finally finds Romeo on the street and challenge to him. Romeo tries to avoid the fight, but Mercutio feels coward and dishonor to Romeo's attitude. Mercutio buy the challenge for protect honor of Romeo and fighting starts, but he is slayed. This event gives one point to conflict of Romeo. He may feel some guilty for Mercutio and this is the reason of conflict and also this guilty gives motivating him to anger to Tybalt when Mercutio is slayed. Then Romeo angry to Tybalt and fighting starts, and he kills Tybalt. This event increases one point to his conflict. He tries to avoid fight, but result is kill Tybalt, and this is the reason for increase his conflict. In same Scene (Act Scene 12), Prince Escalus exiles Romeo from Verona. This event increases two points to
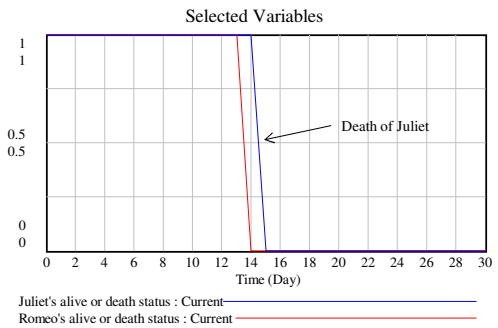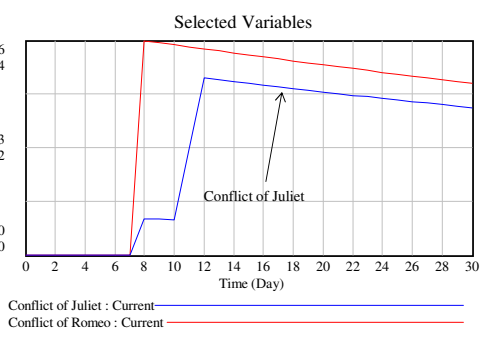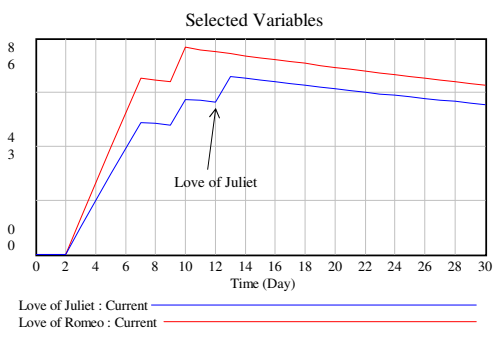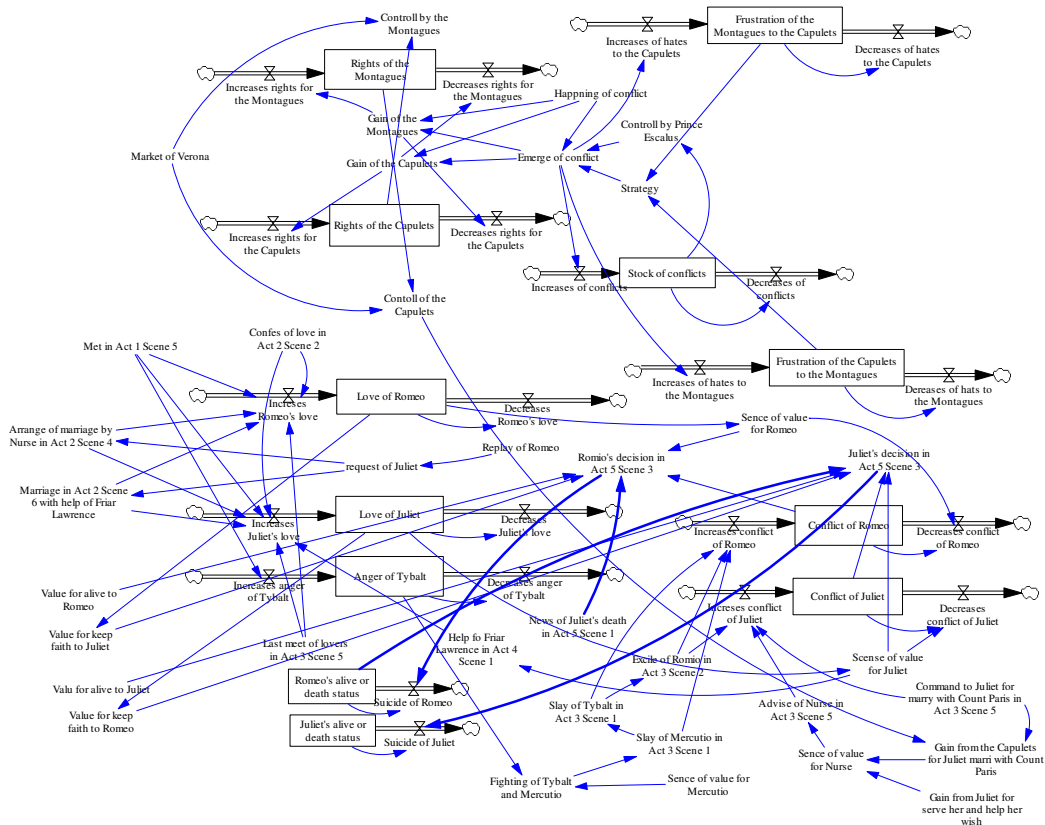
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Fig 7: Quantitative model to climax (model 6) with simulation results

his conflict stock indicator for he prohibited to meets and lives with Juliet. However, if Romeo has a different sense of value, he may adapt new life in Mantua and conflict may reduce.

The model set honor to sense of value for Mercutio. Value of noble society in 16th centuries Europe is, honor should be protected with life, and challenge should be buy. But this model does not decide death of Mercutio occurred by randomness. If stock value of Tybalt is less than -4 (comparatively strong anger), and sense of value for Mercutio is 1 (he has traditional sense of value for honor), fighting is emerged, and fighting kill him. If Tybalt finds Romeo when his anger reduces to -2 (dislike but not much angry), challenge may not happen, or Mercutio has different sense of value, he may not buy challenge of Tybalt. In this case, fighting would not happen. If this is not happen, following event chain reaction may not happen.

On the other hand, conflict of Juliet increased one point by exile of Romeo from Verona in Act 3 Scene 1, then command of Load Capulet to Juliet for marry with Count Paris in Act 3 Scene 5 increase two points, advise of treat Romeo by Nurse in Act 3 Scene 5 increases two points more to conflicts of Juliet. However, sense of value for Juliet influences stock value of conflict. If she has sense of value same as Nurse as commons, she may not keep faith to Romeo.
    Conflicts of Romeo and Juliet also set reducing by time, for 100 days.

This model introduces games theory for explain behavior of Nurse, who knows Juliet loves Romeo and wish to keep faith for Romeo, but gives advises to treat Romeo and stop to support Juliet. In Act 2 Scene 4, when Nurse visiting Romeo for confirm his wiliness of marry with Juliet, kinsmen of the Montagues fun with her and she has not comfortable feeling. She must know she belongs with the Capulets and people of the Montagues dislike her. Although she loves Juliet and she has good impression to Romeo, however she does not love Romeo. While there are opportunity of two families' reconcile, she has chance to keep serving for Juliet and maintaining her gain, but Romeo was exiled, and no chance to get any gain for supporting Juliet. Or worse, if Load and Lady Capulet may angry with her for support runaway of Juliet, she may lose the job. But if Juliet marries with Count Paris, she may keep her job in the Capulet. Compare with two gains, she select her behavior.

The play moves to Act 4 Scene 4 and Juliet feels like she is in surrounded by foes, asks help to Friar Lawrence. Her sense of value set to keep faith to Romeo and the God, but if she has different sense of value, she may not ask help to Friar Lawrence. But in the play, she asks help to Friar Lawrence and Friar Lawrence gives idea, and she finds light of hope. This event increase love of Juliet and she could have belief to keep faith and promise to Romeo and the God.

Then the play moves to climax in Act 5. News of Juliet's death reaches to Romeo in Mantua. This event increases conflict of Romeo and stock of conflicts forces him to select rushing to Juliet or forget Juliet after comparing values. Sense of value for Romeo influences this selection. As mentioned earlier, this sense of value means keep words to Juliet and the God, and faith to Juliet as noble man in 16th century. If he chooses value for keep honor and promise, he selects death. And indicator of dead or alive status switches to 0 (dead status) by his suicide.

This change of status (death of Romeo) causes another chain reaction for Juliet. Juliet awakens from apparent death, and surprises to find death of Romeo beside. She immediately chooses suicide for follow death of Romeo, and her suicide switch her dead or alive status to 0. Her choice of suicide is affected by sense of value to Juliet. But if she does not know the death of Romeo, model suggests she is not choses suicide.

Simulation results of this model show very interesting phenomena. Love and conflict of Juliet are more than Romeo, and this may proves she is very courage woman. For make clear event chain reaction loop R4, stress with thick arrow in model 6.

Of course strong love of Juliet to Romeo moves event chain reactions in the model, however,

author attempts to design sense of value for Juliet gives impact to the cause of R4 event chain reaction loop. In noble society of 16th century, female has also strong value for faith and honor of keeping promise to the God and try to avoid bigamy. Betray of promise to the God is worst sin in those days as their sense of value.

(3) Consideration of model and simulation

There are several arguments when author present first model. One of comments and argument is author should adapt psychological theory for determine character of people in the play. However, author has different opinion. For modeling literature, it may not necessary to adapt psychological theory in many cases. Simple techniques for increase one point to emotion parameter by emerged events may sufficiently enough to explain behavior. Classic literatures such as works of Shakespeare are designed very carefully for make understand story very smoothly to reader and audience. If play writer hastes and tries to jump the story (drop some events), reader and audience feel something wrong, or feel some nonsense. Author of masterworks like Shakespeare carefully avoids such mistakes.

Second argument is validation of the model. Validation of the model for explains literature works could not be same with validation for model of management or other social science. Author wants to insist as model would be sufficient until fully covers story and characters, and behavior shows exactly story tells. This topic will be explained in following section, but adapt model to other literature that looked similar story and compare simulation results may not sufficient validation method. Even story has similarity, however it is not say same structure and model should behaves same way.

Author runs the model in different conditions (parameter settings). All events in the play happen in only one week. Death of Mercutio, slay of Tybalt, exile of Romeo, and command of marry with Count Paris are happen in same day. For make clear the changes by each events, the model sets delay of one day for each events and simulation results continued for two weeks. Of course result is not change, if sets emerge of these even in same day. However, take longer delay, suppose one month, result is changed by reduction of emotion and conflicts (stock values).

It comes from design of the model, but of course event chain reaction leads suicide of Romeo and Juliet never works if any parameter on sense of value is changed. Sense of value may one of major argument on teaching literature. Literature class always asks to student for sense of value is still effective in modern world, or different country or different situation:

1) Sense of value on manliness

In this model, author uses value of honor for Mercutio and Romeo to motivating action. This value means, "challenge should be buy and that behave like a man, and could protect honor as man", and "do everything, even bet own life for maintaining friendship between male". This value makes reason to Mercutio for fighting with Tybalt on behalf of Romeo, even he may know there would be risk to cause his death. There could be argument to this sense of value for immutable or not. Similar sense of value may still exist in modern world, but would not bet life for friendship of man. It may only still remain such sense of value in gangster's world in Japan. It may still understandable, however, author thinks no more effective on this sense of value nowadays. If adapt this model to modern world, thus the simulation result may different by this parameter.

2) Sense of value on faith

This sense of value motivates behaviors of Juliet. Faith to the God may have almost absolute meaning and values for people lives in 16th century. Marriage means swear faith to the God, or promise to the God in those days. It may not have such serious meaning and value nowadays, however, still sense of value on honesty to lover and belief to love would be immutable. In this sense, sense of value on faithful still may effective and working. However, author doubts the sense of value enforces to suicide Juliet in modern days. Duration between events is a key, but may not force to

secret marriage with Romeo, if this is happen today. Modern day Juliet may spends more time to confirm nature and love of Romeo and marriage within one day after they met may hardly happen. Or she may accepts marriage with Count Paris and spend unhappy life, like movie "How Green was My Valley", if sense of value may a bit different, or her sense of value stress of obedience to her parents. However, Shakespeare designs destiny of two lovers to tragedy so perfectly, and set no chance to escape to other possibilities for bring secret marriage first.

3) Chance to success runaway

The story and the model set to tragedy. Arguments may on inevitability of this tragedy. Model structure looks negative answer to this question. Although event chain reaction makes the tragedy, but if this event chain reaction was not happen, this story has chance to be happy ending. There are also so many happy ending stories in similar situation with this play in the world, and true story too. If events happen more long duration, story may also different. All events emerged within one week, while stock value of loves for Romeo and Juliet are still in high level, and stock value of conflicts also stays in high level, gap enforce to move to tragedy. On the other hand, this situation setting (events chain reaction emerged in very short duration) creates tension and attractiveness of the play.

4) Strategy of two families

The model set two families may select opposed for strategy during stock value of hates maintaining less than -4. This model does not use games theory for selection of the strategy. However, the Capulets is comparatively good positioning in games theory of political strategy, from author's view. Conflicted situation in zero sum status, keep opposed strategy may not make monopolize of market for the Mongagues, until the Capulet lose the power and capability with accident, for example with epidemic.

Since the Montagues is in comparatively weak positioning, best way is approve marriage of Romeo and Juliet and reconcile with the Capulets for control market of Verona. It is actually only chance this family may survives strategically.

On the other hand, the Capulets could be more close with Prince Eslaus with marriage of Juliet and Count Paris, and Load Capulet may get monopoly control right of the market lastly. But Load Capulet would approves reconcile, if runaway of Juliet and Romeo would success, and if he could know to have grandchild. This strategy called merge strategy in modern business world. Such stories are exists in this world. As the attempt of Fair Lawrence, approve marriage of Rome and Juliet is indeed best strategy.

6. Conclusion

Author attempts to show simple story like Shakespeare's "Traded of Romeo and Juliet" could possible to explains with evolving SD model. Although technique may primitive and not incorporate psychological theory, however sufficiently could develop SD model, if characters of the people in play are basically simple natures. Although evolving SD modeling technique may not new and innovated, however author wants to insist explain literature with evolving SD model may very powerful and effective way for teaching literature. By events in the story, add loops, or add linkages and evolve the model. Basically it is not difficult techniques at all.

All elements in the outline of the story determined in the section 4 are covered in the model. All elements in the determination of character in the section 4 are also covered in the model. Simulation results meet with the story. Therefore, as conclusion, author believes success to explain story of Shakespeare's "Traded of Romeo and Juliet" with evolved SD model, somehow.

Unfortunately, author does not have experience to take English class in UK or USA, and not know well how and what teachers teach classical literature in their class. But experience in Japan, teacher asks to student for consider what might motivating behavior of peoples in the literature, and further asks that sense of value still be same in modern world, or in different situation. These questions help to understand further understanding literature. SD model may help to understand same way for literature and confirm with simulation. Including sense of value in the day when the literature was written is also not new techniques in teaching classical literature in universities. Author finds

interesting attempts for high school English class in USA. Literature [12] is teaching material for teach "Romeo and Juliet" in high school English class. Students are almost same age of Romeo and Juliet. In this material, asks to student whether they have experience to like someone their parents is not agree, what may their ideal partner, and suppose if they are Juliet, or Romeo, what they may do in such situation in modern American society. This may a sort of simulation and such simulation may help to understand classical literature more deeply.

7. How different but story looked similar – case of musical West Side Story

What would be happen if the story of Romeo and Juliet was happen in later 20th century, downtown New York, USA? Musical West Side Story attempts such challenge. Actually, this musical intensively aims to adapt the story to downtown New York in modern time. However, analysis with SD model and simulation result shows difference of two stories.

1) Qualitative model

Characters setting and environment are same. Conflict between two families is changed to conflict between two gangster groups, the Jets and the Sharks. The Jets, gangster group of Italian 2nd generation is the Montagues and the Sharks, Puerto Rican immigrants is the Capulets in this musical. Riff is the leader of the Jets and play roles of Load Montague. Tony, who roles Romeo in this musical was second man in the Jets and believes he leaves from the group, while still Riff does not admit. Maria, sister of Bernardo roles Juliet, just comes from Puerto Rico recently for marry with her fiancé Chico, second man in the Jet. Bernardo is leader of the Jet, and roles Load Capulet. Officer Krupke is Prince Escalus in this musical. Since characters and situation in the musical are same with the play, it is possible to adapt model 1 and model 3 with just change their names.
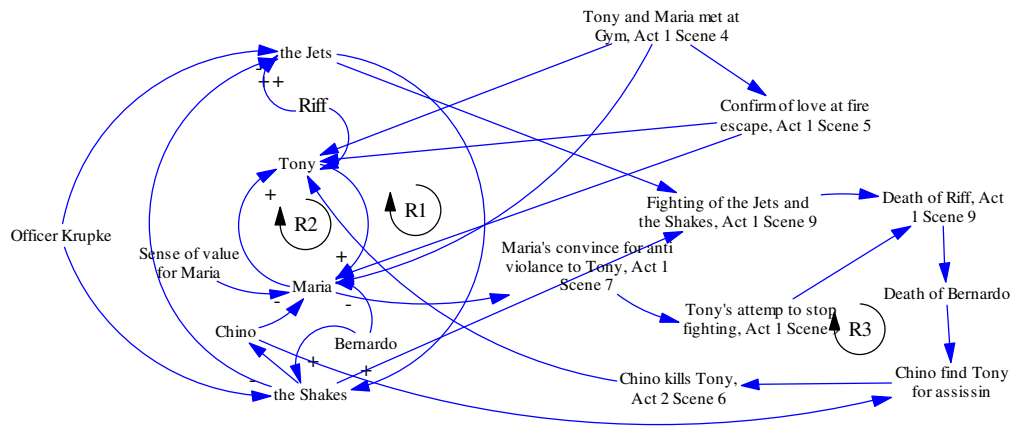

Figure 8: Qualitative model (model 7) for West Side Story

However, model 2 and model 4 for Romeo and Juliet could not be same for this musical. In Romeo and Juliet, Shakespeare prepares 4 events for design to leading to lover falls in love, and step for reaching to this stage is very smooth. Juliet confirms character of Romeo for asks to marry, but this scene is more on confirms character of Romeo as trustable person or not. With his answer and his behavior, audience can understand he is pure, honest and faithful character on behalf of Juliet, even he never talks about him. It is true, he never say he is honest person nor any of his friends say. Even so, audience can know his honest sincerely character, from eye of Juliet. The play designed very naturally and smoothly moves on story. On the other hand, the musical set only two steps to make fall in love, after Tony come for offer fighting to the Jet to the Gym, and met with Maria, search Maria, find her on fire escape, talks and then suddenly both falls in love and trust each other. Compare with two literatures, the musical looked rather roughly designed and rush to move story.

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For example of Tony's character, it looks a bit difficulty to accept his pure, faithful and serious personality smoothly in Act1, Scene 4 and 5. He was a member of gangster, but fall off (wash hands of the gangster). This situation setting could be supportive fact as he is trustable and honest person, and audience can accepts his character, however, not much smoothly, even on behalf of Maria. On the other hand, in the play, Juliet confirms character of Romeo at least twice, ask him to marry (that means ask his seriousness), and sends Nurse to confirm he is really come to Friar Lawrence for marry with her. Anyway, this is musical, but not play, therefore, accepts character and moves story. Main attractiveness of musical is songs and dances, but not much on story tells. In that sense, structure of two models (model 3 and model 7) could assumes almost same. Show qualitative model for the musical on figure 8. Difference is only lack of event chain reaction loop (R4) for model 7.

2) Quantitative model

Figure 8 shows qualitative model for the musical with simulations. Basically author adapt model 6 and modify for the musical. Same as the model for play Romeo and Juliet, Tony and Maria falls in love in the hostile environment between the Jets and the Sharks. Similar event chain reaction leads to death of Tony. In the street fighting of Riff and Bernardo, Riff was killed by Bernardo when Ton tries to stop the fight, and accidentally Tony kills Bernardo. Chino, fiancé of Maria has revenge to Tony and tries to assassin. But it was necessary to make some translation to set sense of value for motivating Maria, Anita and Chino for develop quantitative model. Sense of value to Maria for select Tony, even she has Puerto Rican fiancé Chino, and comes from her country for marry with him sets after compare value for live in America as immigrant and wife of gangster, or live as wife of white American, who is not gangster, and be citizen herself, as follows the games theory in this model. It is not clearly mentioned in the musical, but suggested with song "America", in Act 1 Scene 5.

Table-2: Maria's value and gain by games theory (in West Side Story)

Gain/loss from marry with Tony for Maria	Gain/loss from not marry with Tony for Maria
+3 (she can be wife of white and may get citizen ship of USA, as well as she can live in normal society and expect bright future)	0 (she must live as wife of gangster/illegal immigrant, and not expect much bright future)

To try to set sense of value for motivating Chino to assassinating Tony, but could not success. Author assumes jealousy and anger to take out his fiancé motivates his behavior. Again, there is not clear supportive information in the musical, but without that, it is rather difficult to understand his motivation to assassinate Tony. Therefore, author does not incorporate sense of value for his activity but design emotion moves him to kill Tony.

Again try to set sense of value for Anita, but could not find sufficient one. Anita is fiancé of Bernardo and expects happy life. She has anger when her fiancé was killed by Tony, basically. When Maria finds she could not go to meet with Tony by interruption of police investigation regarding murdered of her brother Bernardo, she asks to Anita for deliver message to be late to Tony. When Anita visits the place where Tony hided, she was harassed by member of the Jets and out of temper. These anger motivating her to tell a lie as Maria was murdered and this lie leads death of Tony. Again, emotion moves Anita and betrays Maria. But Nurse in the play does not behave by emotion, rather she behaves based on calculation of expected gains.

Compare two models (model 6 and 8), people in the play behave and act rationally, however, people in the musical behave quite emotionally. This is big difference of the play and the musical.

Character of Maria is again could not assumes same with Juliet. Maria is pure and gentle girl, however, not have strength to carry destiny on her way, like Juliet. Thus stock of her love is not increase high level like Juliet, and comparative weak character makes difficult to select her for following death of Tony, though the musical explains bullets in the gun are all consumed for assassinating Tony. In passionate, she would be following suicide, but it would be forced by emotion.

It would not motivated by sense of value on faith or belief. Of course there would be arguments, and author does not deny emotion moves behavior, specially decision to suicide, but people in the play behave based on ration, though people in the musical behave based on emotion, that what author can say based on the SD modeling analysis.
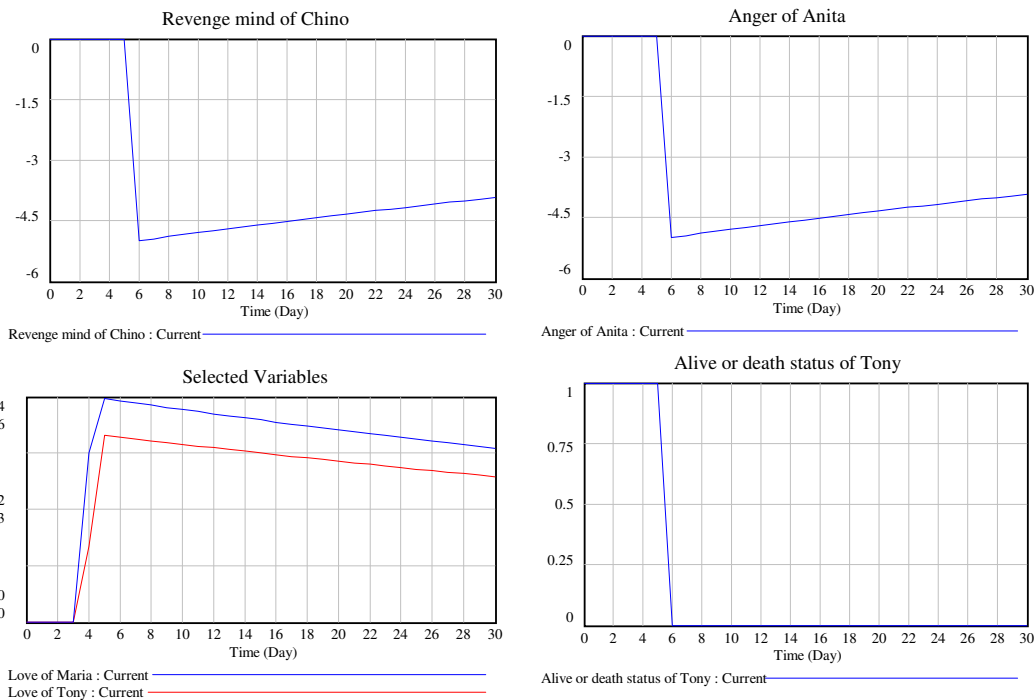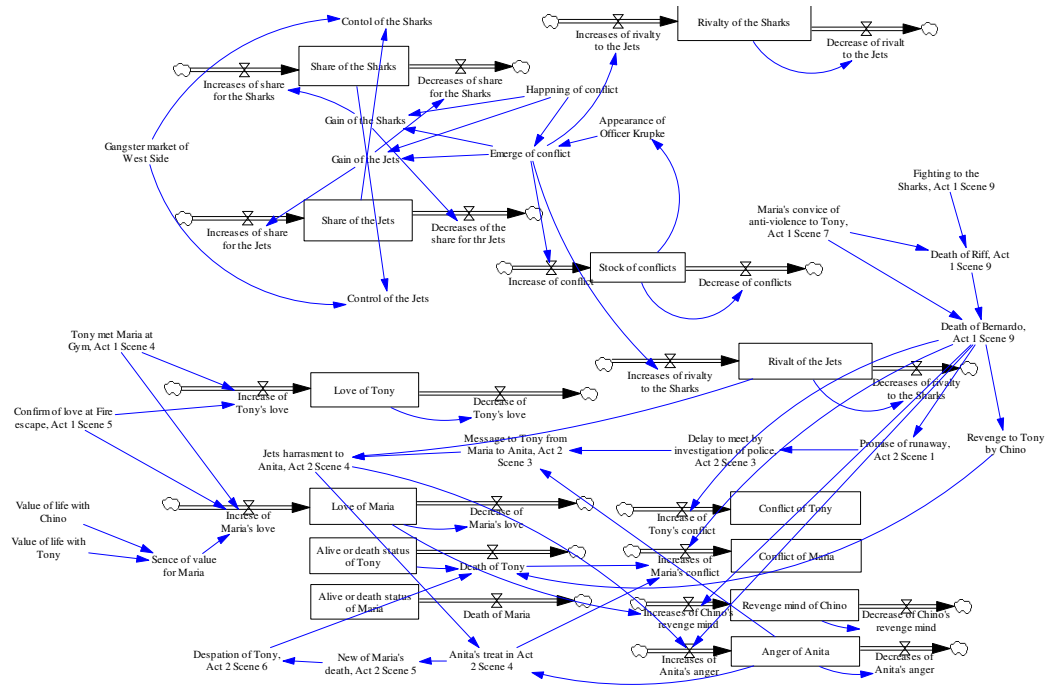

Figure 8: Quantitative model (model 8) and simulation results for musical West Side Story

Author hopes this paper success to explain the musical West Side Story is not the story simply translate the play "Tragedy of Romeo and Juliet" into modern days of USA. Or, explains author Arthur Laurents (script writer) intends copying the play into circumstance in downtown New York, but his modification makes difference in structure and character. In that sense, author believes the musical is different with the play, in term of people in the musical moved by emotion, while people in the play acts rationally.

8. Further study

Model of Romeo and Juliet was developed and presented in the monthly meeting of JSD in 1994, and this paper based on this first version SD model. In the meeting, Professor Toshio Mitsufuji commented as how to describe nature and character in the play would be subject. For answer to his comments, it may enough to set nature and character for case of Romeo and Juliet introduced in this model, as their nature and character is straight and simple. However, his comment is sufficient when modeling for another literature, such as later works of Shakespeare, or novels in Victorian period aims describing growth as human.

Author has guts feeling on adaptation of the games theory for describes winding, ill minded negative nature in the literature by experiences of modeling other literatures and hopes to have opportunity to introduce such model. But not success to develop sufficient model for explain growth as human that many novels including woks of Charles Dickens aim to describes in their works.

Notes:

1) It may different description of escalation as follows, but author rather insists double loops may more success to explain the play.
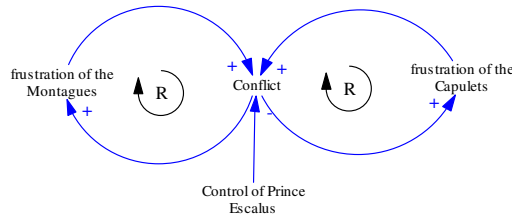
Also, this paper does not shows transitional qualitative models for translate original qualitative models to quantitative models. Qualitative models show in this paper not means these could be equally transferable to quantitative models show in this paper. However, it may understandable by comments on qualitative models as, assumes conflicts situation translate as conflicts for sharing market under zero sum game, from model 1 to model 4, for example.

2) Although scaling of psychological emotion moves between from +5 to -5 in this model, however, this model does not adapted rigorous quantum scaling. Sometimes parameter shows such as -5.4, or -4.8, but still simply these mean "-5", that determined hate. Love indicators sometimes exceed more than 5 because the model simply increases or decreases one point (in most case) to parameter when event happen.

3) Model of Romeo and Juliet by Professor John Morecroft [4] assumes love of Romeo to Juliet (or visa versa) maintaining while they loves each other, and reflected stock volume of love from others, while author's model is simply increase or decrease to stock by event. Emotion including love may continuous flow, not one time, if consider long duration. However, by author's experiences, increasing or decreasing degree of emotion by event is much simple for modeling literature, and also this method still explains behavior of people in the play sufficiently.

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