

Elderly's Family Life Supplies - Innovative Chinese Checkers Game Board

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Abstract: The product design course for industrial design students was implemented in our university which spans 9 weeks. Throughout the creativity rules and field study, students achieve high standard on problem identification and concept generation. The prototype test with elderly in design projects is helpful to make students with deeper understand user demand, which in turn enhance the concept further. Traditional Chinese checkers are redesigned using special checkers with different height or shape and specific rules to increase user interest and game diversity. Game is more challenging due to location weighting on score calculation to planning its strategies. Redesign Chinese checkers game board include reconfigurable board and several shape checkers. Checkers has 3 parts: standing ring body, the base body, both support the side holding structure. The body shows slightly concave to facilitate the fingers hold. The upper portion of the body is provided with different shapes extension section which can be engaged with base body. Player move the checker to the opposite target area. When one of player moved all the checkers to the opposite target area; they shift to the scoring calculation stage. The participant may develop specific strategy to gain higher score by maximized weighted checkers into its target block regions.

1. Introduction

1.1. Creative design

Design is often a highly multidisciplinary subject. There are many stages in the concept generation to consider user requirement and technologies feasibility [1]. It will be involved in both concept generation and the evaluation phase. The education institutes usually do not have enough experts to enable a true multidisciplinary guidance. Observation and field study are required to enhance feasibility of design thinking.

Empirical data on design processes were obtained from a set of protocol studies of nine experienced industrial designers [2]. Aspects of creativity in design are related to the formulation of the design problem and to the concept of originality. They also propose refinements to the co-evolution model, and suggest relevant new concepts of 'default' and 'surprise' problem/solution spaces. In [3] paper uses three case studies to discuss the importance of a total integration between marketing research and design at the concept stages of new consumer product development and throughout the design development and marketing process of the product. In [4], the designs for behaviours change by testing the potential of priming and collective concerns were reviewed.



Incorporating into subconscious priming stimuli for each of the major senses; the studies showed a significant effect across all senses.

1.2. Elderly

Ageing populations are on the rise worldwide. The 21st century is destined to have an increasingly ageing population of elderly individuals. Health is one of the most determinant elements in quality of life in the elderly. Therefore, strategies are needed in order to improve their quality of life [5]. Retired elderly individuals have more time for leisure activities and may devote themselves to their preferred hobbies and activities. Being occupied may prevent the elderly from falling into a sedentary lifestyle and to slow down the effects of ageing. A moderate correlation was found between being active, be it with daily tasks or leisure-related activities, and a higher degree of perceived health [6].

Currently there is around 0.25 million Taiwanese with dementia, and in 2030 this number will double to around 0.47 million. This not only affects the patients themselves, but also their families as well. By utilizing toys, it is hoped that the patients can engage in activities and slow down the degradations caused by dementia.

1.3. Chinese checkers

Chinese checkers game boards are often played by the elderly. Due to its simple rule, after players grasp its knack, it's easy to win and thus they would lose interest. Checker pieces are often in conical shape, which is difficult to hold. Plastic pieces can be unstable, making them easy to tip over by accident, thus affecting the game.

The shape of the existing checker piece is conical, which is not easy for the finger to hold, elderly may accidentally push down or touch other pieces. In addition, some of the elderly have cataract problems. For cataract patients, purple, green and red colored lights can be more easily seen, while blue light is less visible. This is due to the light being filtered out in the eye, therefore eye diseases such as macular degeneration or other degradations must be considered.

2. Design procedure

The product design course for industrial design students was implemented in our university which spans 9 weeks. Throughout the creativity rules and field study, students achieve high standard on problem identification and concept generation. The course is provided in Department of Industrial Design as the first project for young designer (year 2 students). Students are required to design elderly utility that without high technology elements. The product concept of checker is provided here to indicate brainstorming and creative thinking process.

Basic creativity rules (such as Reverse, Transfer and Combine) [7] and field trip was introduced in the first 3 weeks. The mind set help extend thinking domain were introduced with visual representation [8]. Then each student choose individual problem to design through both conceptual drawing and hands-on prototyping (during 4 weeks). Students created their own design, teacher guide them how to judge and balance each design factors. Finally, they take two week in presentation and panel design.

3. Concept design

3.1. Innovative checkers

Innovative checkers have different height or forms; they follow different scoring rules which can increase the challenge. The innovative Chinese checkers has a new scoring system related to piece's tallness or type to make it more fun to play. Pieces of different tallness or type have to be moved to the designated area for more points. The colors of red, green and yellow are chosen for the color of the pieces.

Tallness of the pieces represents family seniority. The taller senior pieces are places at the end of the section. High score is achieved not only by moving pieces to the opposite target region, but also

have the senior pieces moved to the end of that region (figure 1). Players now have to plan their strategies to move senior pieces out first, and use shorter junior pieces as the jumping platforms.

The shape of the pieces is redesigned for elderly so it is easier to hold, more stable and less likely to tip over others during action. For the shape to be easier to be held, the curvature of the pieces is designed to be greater, so fingers can more easily grasp. When moving the pieces, it is more stable (figure 2), so it is less likely to drop and affect other pieces.

The concept generation process refers to the following creative rules:

- Reverse: checker is usually same size and shape, concept to use asymmetric or non-uniform shape to increase the challenge.
- Transfer: select the traditional family "hierarchical structure" as the main element, transfers the element into checker's pieces.
- Combination: checker frame is modified and combined with scoring calculation rules to increase the challenge.

According to the co-evolution model [2], the creativity rules support in extended thinking domain which suggest relevant new concepts of 'surprise' problem/solution spaces. In [4], incorporating into subconscious priming stimuli for each of the major senses; the studies showed a significant effect across all senses. The checker design provide more sense involved such as: sight (the shape represented family member), touch (easy for grasp), and thinking (strategy).

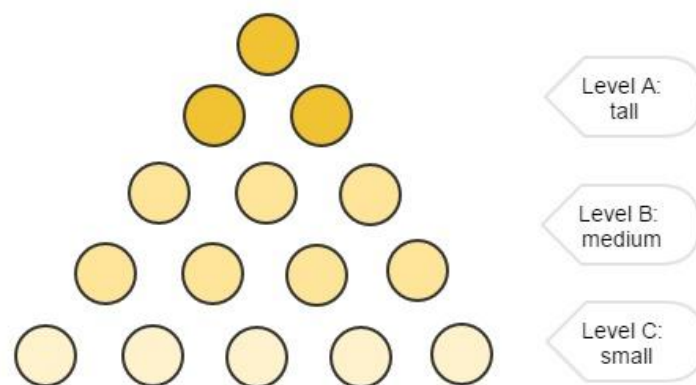


Figure 1. Chinese checkers placement original concept.



Figure 2. Shape of the pieces needs redesign.

3.2. Play method and scoring

On the aspect of play approach, rules are designed to increase the fun factor and ways of thinking, by using pieces of different height or type. In figure 3, in order to move the senior pieces to the end of the opposite region, players must plan strategies accordingly. When one player moves all pieces to the opposite region, the game ends. Players stop moving any more pieces and enter the stage to calculate the final score.

During the calculation step, besides counting all pieces entering the target region as one point, there will be weighted points too. Those senior shaped pieces entering the inner section of the target region can gain more points. Even though one player has already moved all pieces to the opposite region, it does not necessarily guarantees victory. Once the weighted scores are considered, the final score might favour the other player.

For example, the seniority of two levels, depending on setting by both sides there are 3 or 6 higher level pieces, this setting is simpler and more suitable for beginners. After the players are familiar with the rules, then they can play the game with three seniority levels. Even though the rules are the same, the player has to manipulate three types of pieces and weighting scores, making the game more complex and suitable for advanced players.

Play method 1:

- (1) Pieces need to go back to the same color / same block region,
- (2) Block regions include (large → medium → small) arrangement.

Play method 2:

- (1) Pieces correspond to the same pattern, block region (large → medium → small) arrangement,
- (2) Given the weighted score, the player with highest accumulated score wins, where A region gains 5 points, B region 3 points, C region 1 point.

Unlike tradition Chinese checkers, players decides on the division with weight, and with this plan move the pieces strategically, which also is more challenging. Using figure 4 as the example, the scoring of setting with 3 or 6 higher level pieces is as following.

The upper left part of figure 4 shows three senior pieces at the senior section, so the score is $3 \times 3 + 12 \times 1 = 21$. Lower left part of figure shows the score of $3 \times 2 + 13 \times 1 = 19$. Consequently, the upper left one is the winner. Upper right part of figure shows the senior group with 6 pieces, and the score is $3 \times 6 + 9 \times 1 = 27$. Lower left part of figure shows the score of $3 \times 4 + 11 \times 1 = 23$. Consequently, the upper left one is the winner. Therefore the first to move all the pieces to the target region is not necessarily the winner.

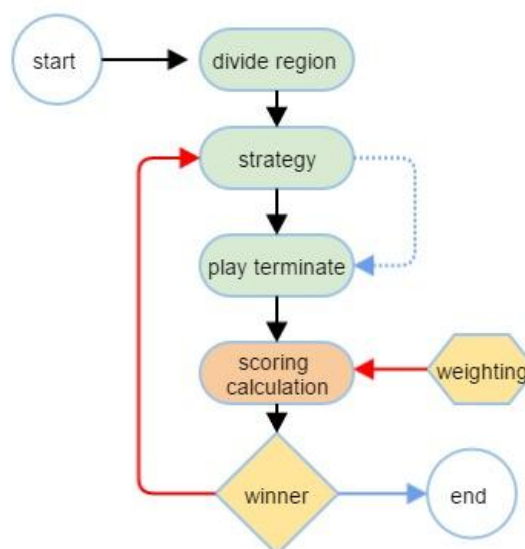


Figure 3. Flow chart: players have to plan their strategies based on weighting.

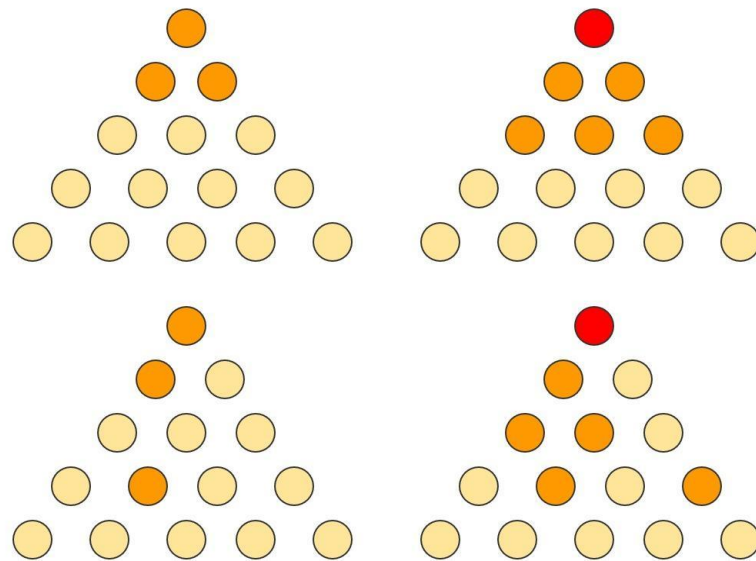


Figure 4. Weighted scores calculation, the upper left ($n=3$): $3 \times 3 + 12 \times 1 = 21$, the lower left: $3 \times 2 + 13 \times 1 = 19$. The upper right ($n=6$): $3 \times 6 + 9 \times 1 = 27$, the lower right: $3 \times 4 + 11 \times 1 = 23$.

4. Structure adaptation

Figure 5 shows structure design of the variable height pieces. The piece includes: one standing ring shaped main part, one basement with mass. The two are locked together at the basement's side. The main part is slightly curved inwards, so it is easier to hold by the finger. The top of main body has one section with a removable extension part, which can be inserted into the main body, and locked to the basement to form a piece with variable height. Regarding the design variation of shape, user can select shape depending on geometric form or schematic outline of higher level pieces. One can have a senior shaped or change to have a junior shaped piece, so they can be distinguished from other types.

Secondly, the design of the board must also be adjustable in order to separate relative position of the seniority groups. At the start when pieces are placed, target region has to be marked for different seniority groups. One way to do this is to add a transparent layer on top of the existing magnetic Chinese checkers board. Seniority groups use different patterns of the main colour to represent blocks region. Different groups can be distinguished by different stripe patterns (figure 6), for example the number of stripes; it is easy to distinguish three seniority sections in the target region. When the seniority group region is fixed, the transparent layer can also be fixed on top of the board to avoid instability.

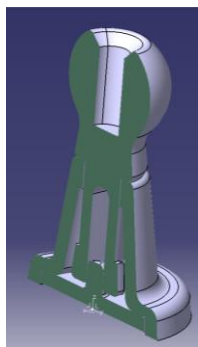


Figure 5. Structure designs of the variable height pieces (by Z. H. Lau).

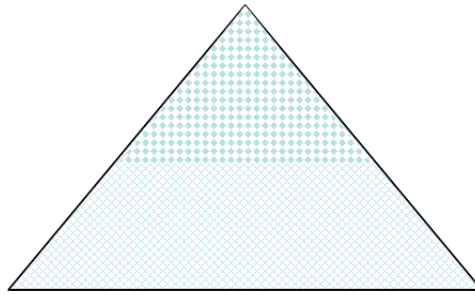


Figure 6. Different region can be distinguished by patterns or shading.

5. Conclusions

The product design course for industrial design students was implemented. Throughout the creativity rules and field study, students achieve high standard on problem identification and concept generation. Toys can enhance interaction and brain activities of dementia patients and slow down the mental function degradation. The elderly likes to play Chinese checkers, which suitable for two or more players. Elderly also likes to be accompanied or to play with grandchildren, so they can chat while playing.

By adding rules about pieces of different height or type, it is hoped that it can increase the fun factor and encourage a more diverse strategic thinking. The change of pieces' shape allows elderly to hold with ease, avoid pieces from tipping over, or touch other pieces by accident during action. The seniority level concept originates from the elderly, but it does not limit the player to only elderly people. The board game can attract players of different age group, and offer good experience.

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