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(54) **INTERACTIVE GAME SYSTEMS AND METHODS**

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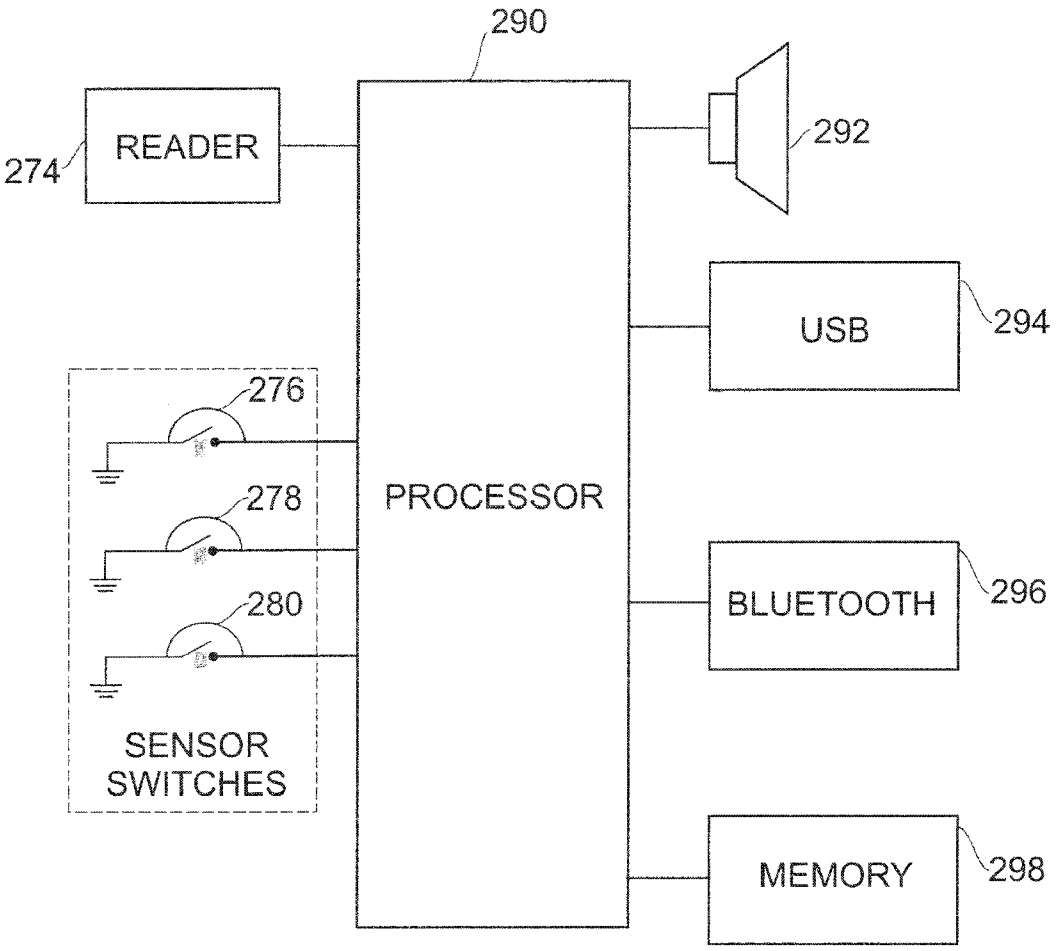
(57) **ABSTRACT**

A game system and method is described which may suitably employ a very inexpensive game mat or course which is printed with detectable markings, such as microdots. A toy housing holds a play pod which senses the sequence of the detectable markings as the toy housing is moved on the game mat. The play pod may be releasably held in the toy housing and transferred to a different housing. In this approach, to change games, a different game mat and toy housing are selected and the play pod is transferred to the new toy housing.



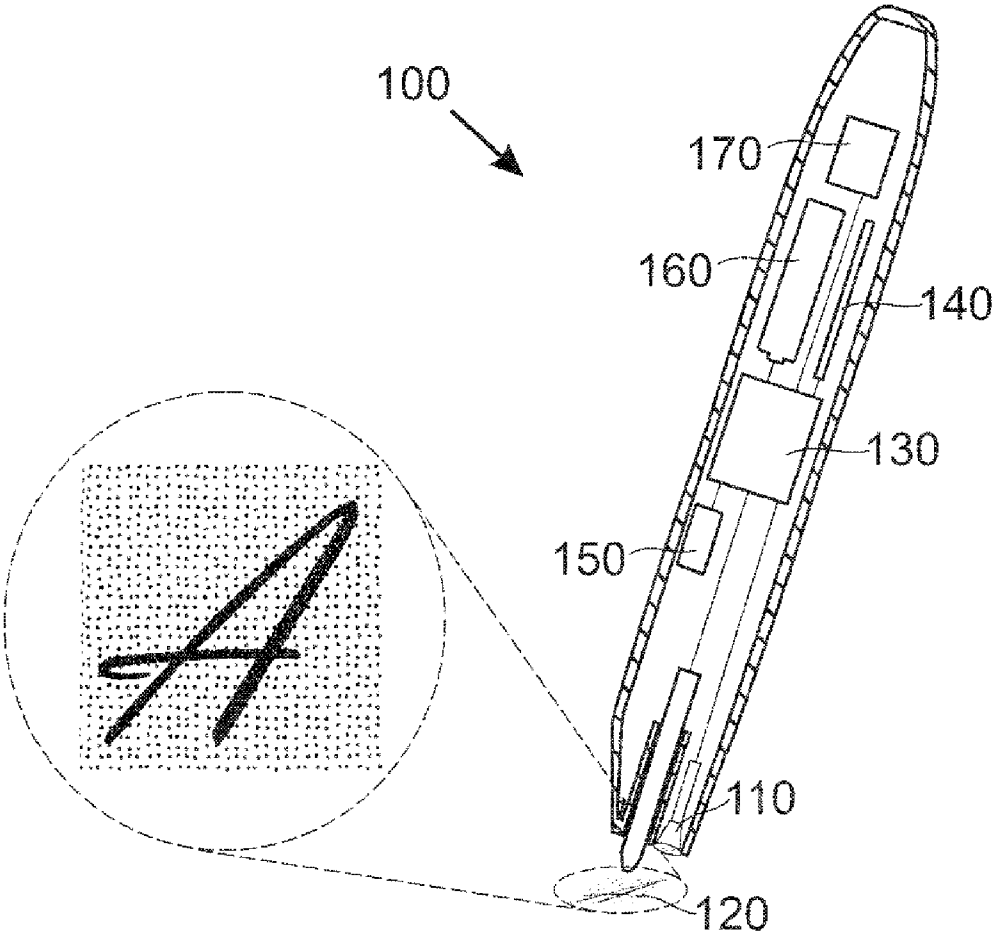


FIG. 1

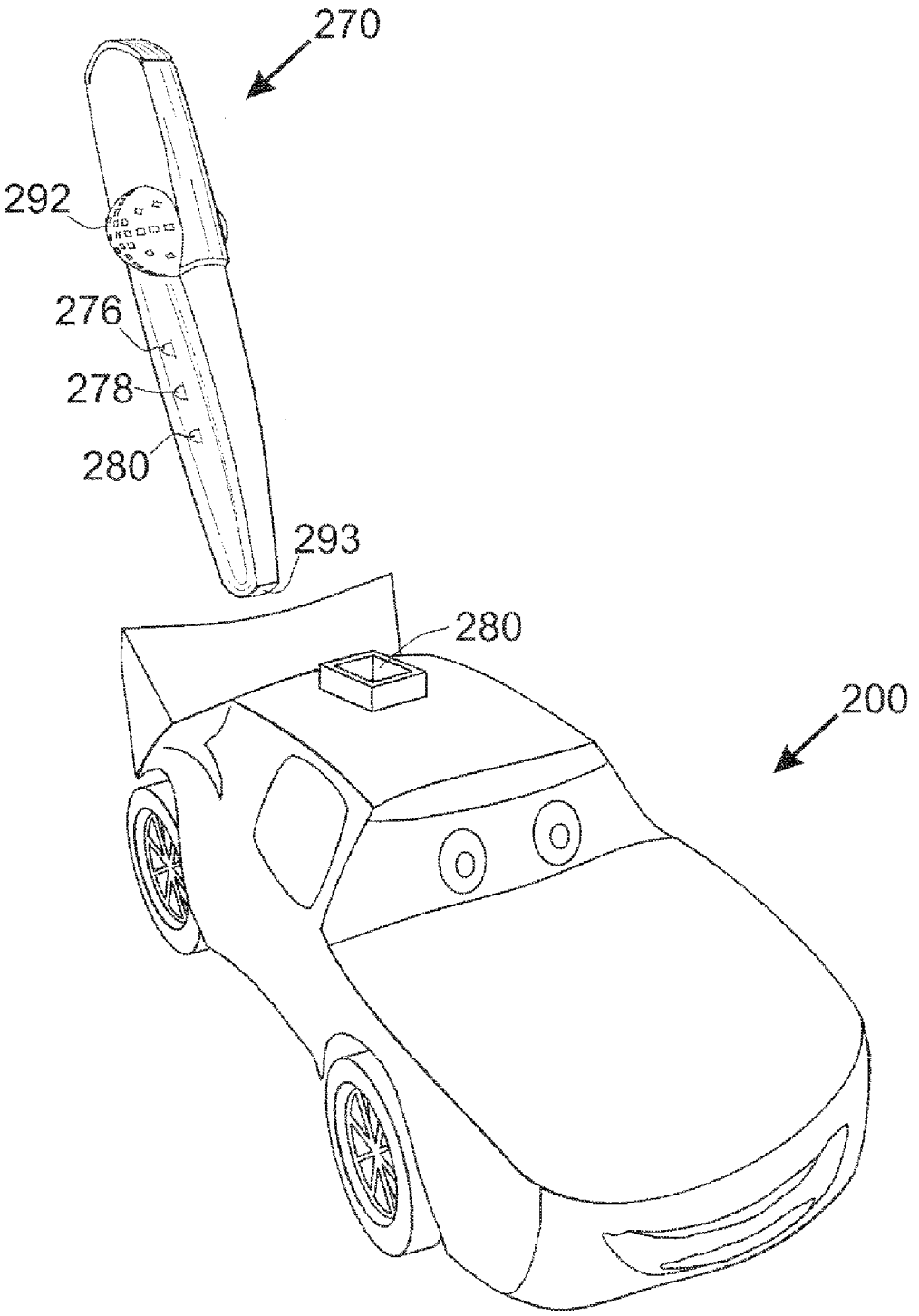


FIG. 2A

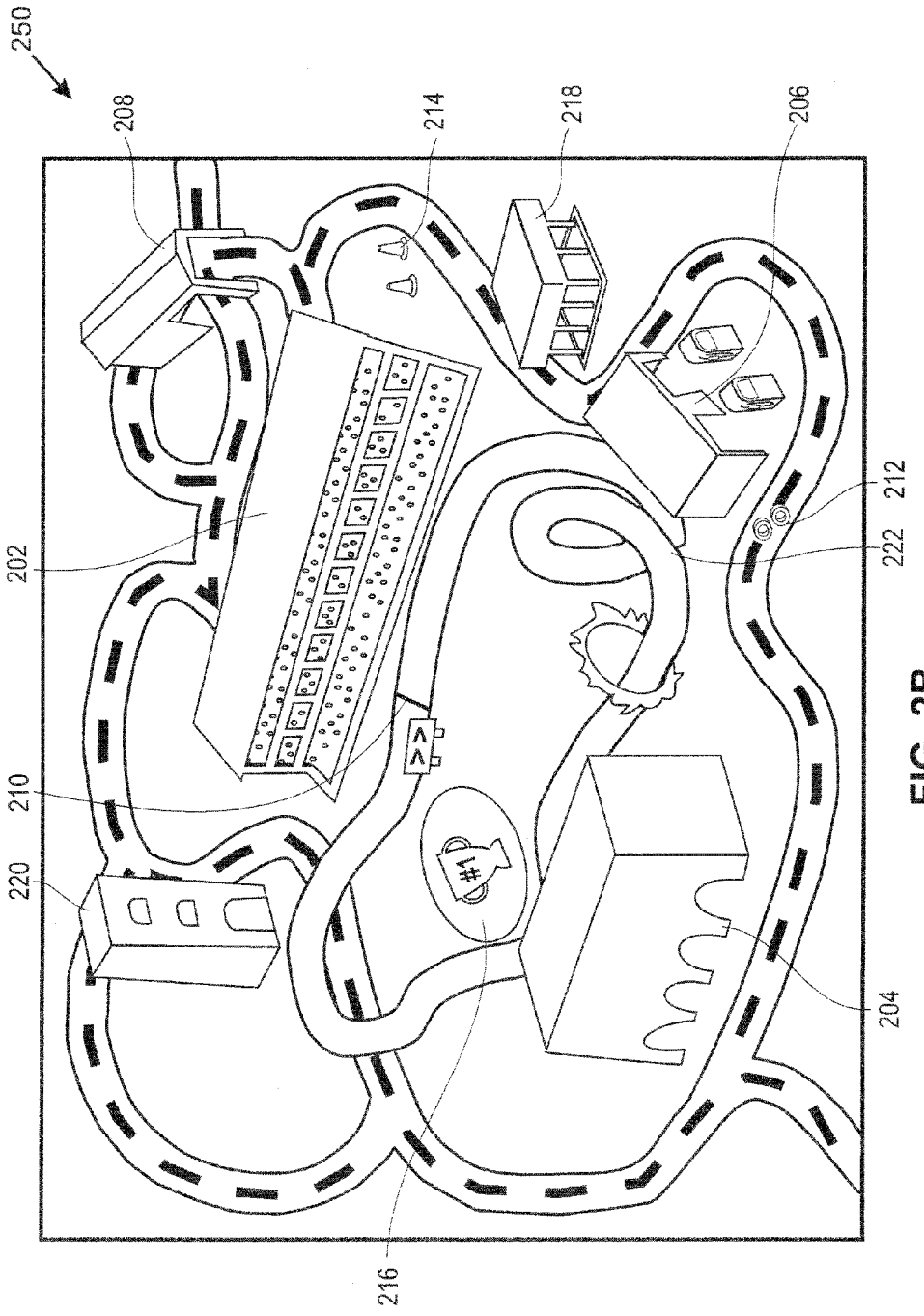


FIG. 2B

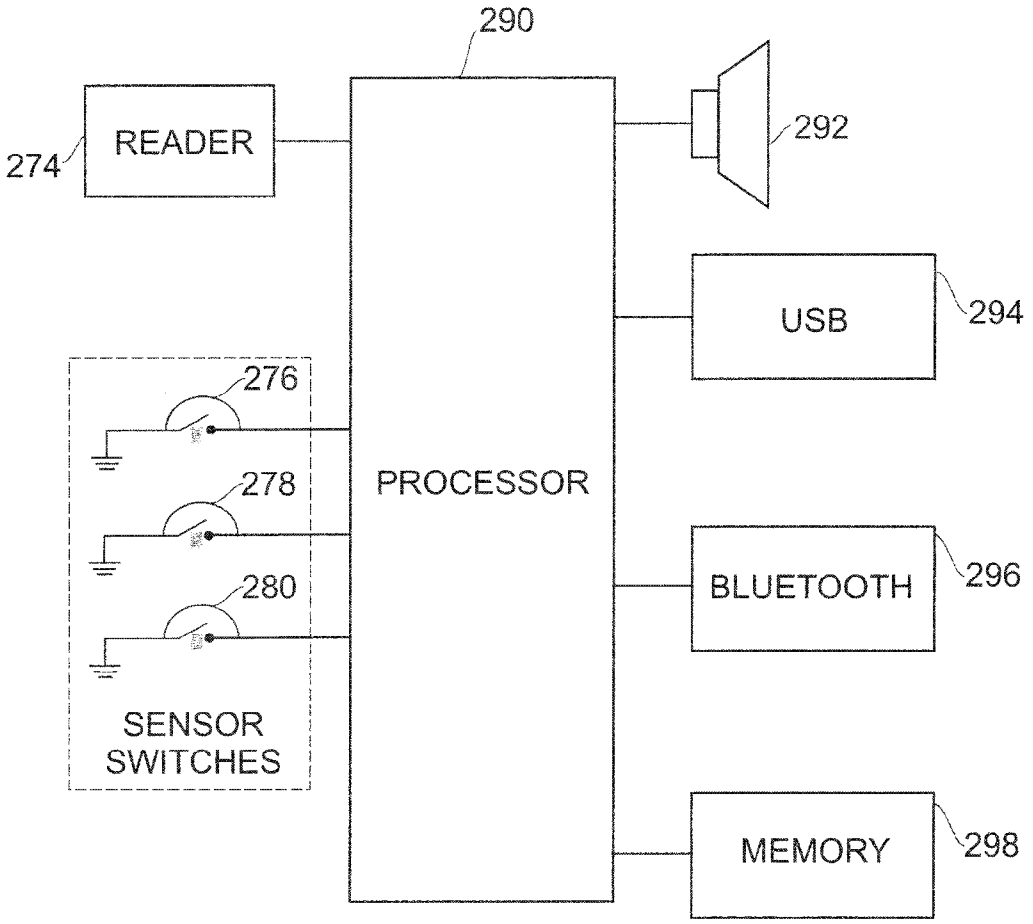

290
READER
274
292
USB
294
276
278
280
PROCESSOR
SENSOR
SWITCHES
BLUETOOTH
296
MEMORY
298

FIG. 2C

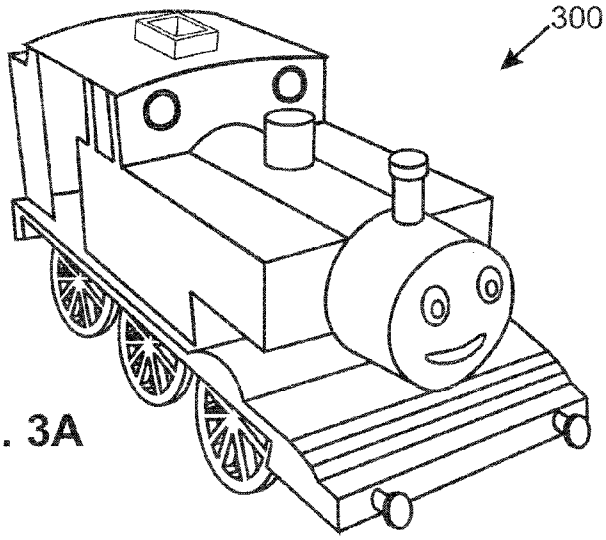


FIG. 3A

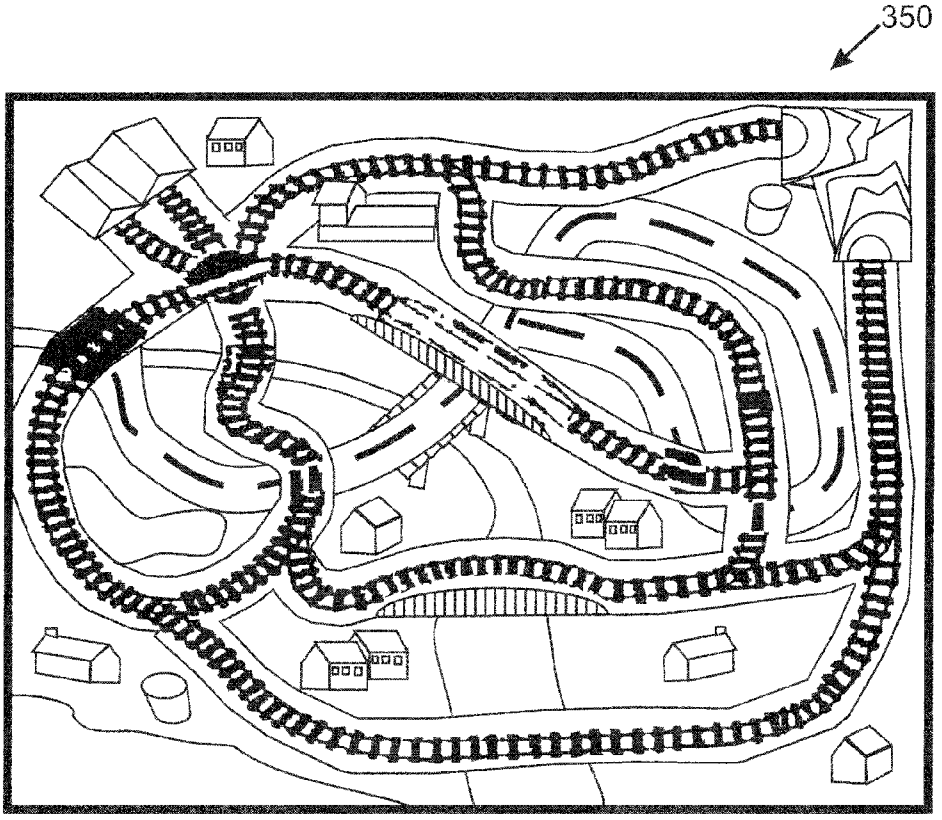


FIG. 3B

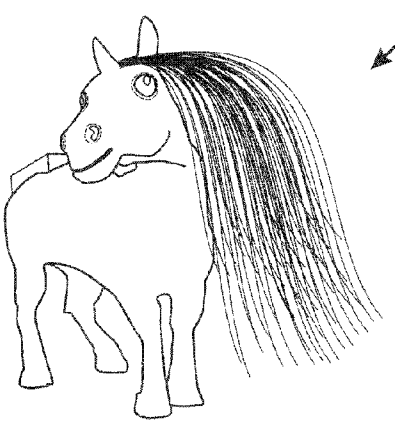


FIG. 4A

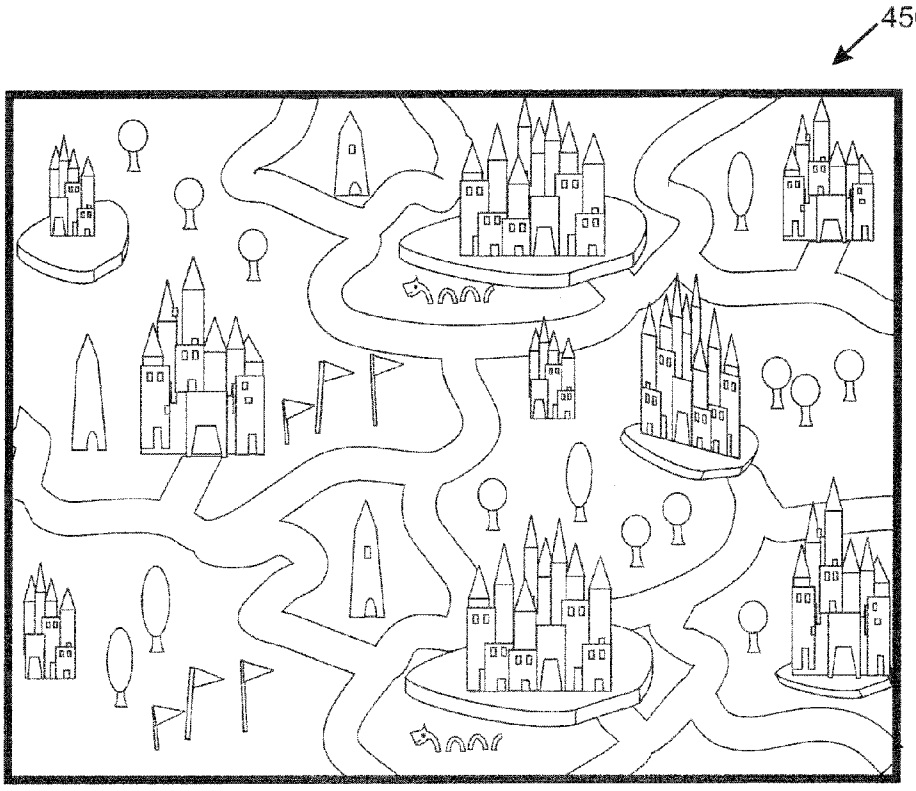


FIG. 4B

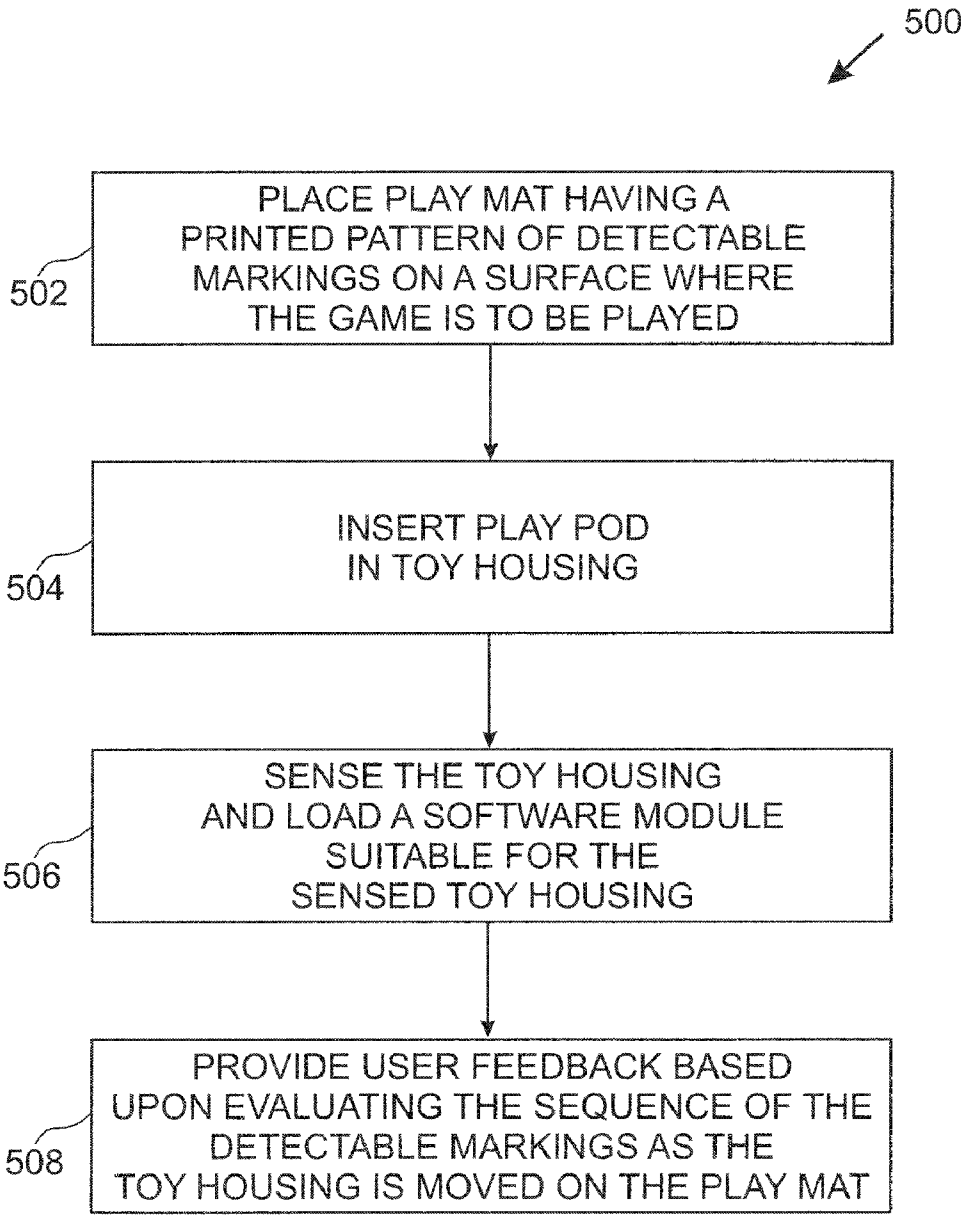

500
PLACE PLAY MAT HAVING A PRINTED PATTERN OF DETECTABLE MARKINGS ON A SURFACE WHERE THE GAME IS TO BE PLAYED
502
INSERT PLAY POD IN TOY HOUSING
504
SENSE THE TOY HOUSING AND LOAD A SOFTWARE MODULE SUITABLE FOR THE SENSED TOY HOUSING
506
PROVIDE USER FEEDBACK BASED UPON EVALUATING THE SEQUENCE OF THE DETECTABLE MARKINGS AS THE TOY HOUSING IS MOVED ON THE PLAY MAT
508

FIG. 5

INTERACTIVE GAME SYSTEMS AND METHODS

FIELD OF THE INVENTION

[0001] The present invention relates generally to improved toys, play and learning games, and more particularly to a highly adaptable system for providing user feedback which may suitable employ a very low cost game mat or board.

BACKGROUND OF THE INVENTION

[0002] New learning technologies, such as the Leap Frog Tag system, employ a pen **100** illustrated in FIG. **1** which utilizes an infrared camera **110** that detects unique micro printing dot patterns **120** on printed surfaces such as books to promote reading, as well as, learning to print or trace characters, such as numbers or letters. Other components of pen **100** include processor **130**, memory **140**, and force sensor **150**, battery **160** and Blue Tooth transceiver **170**. This technology has enabled new types of point to touch book related learning schemes for young children.

[0003] Pen based learning systems such as the Tag system, offer a novel interactive learning experience. However, there are severe limitations to a pen form factor and book embodiment for this technology. The Tag system's pen design is simply a point identification tool, which does not inspire creative play activities or interpret continuous motion based gestures. The Tag system's pen design and software is made solely for a specific purpose, which is touch point reading or writing based learning. Thus, only books are provided as interfaces of learning. Also, the tip of the pen is quite pointy and could tear the paper if dragged on the surface. The current touch point systems do not fully utilize the capability of the micro printing or similar technology for providing interactive and reactive play scenarios.

SUMMARY OF THE PRESENT INVENTION

[0004] Among its several aspects, the present invention recognizes that while learning can be fun, children can also perceive it as work or get bored with it while wanting to play with toys like cars, trains, unicorns, dolls and the like, for hours. A need exists for young children to have highly interactive toys and play surfaces that provide numerous guided and reactive play learning experiences. As used herein, a reactive play experience is when a toy detects and interprets a child's movements and provides feedback and additional play scenarios based thereon which teach a child appropriate creative play activities.

[0005] The present invention improves upon and adapts many of the general components found in the Tag system to read and interpret movement based patterns and react to them in a play manner, compared to touch point book based activities. However, the invention substantially changes the form factor, hardware, and software algorithms to capture the unique form factor, multiple play schemes and play activities relating to motions of toys, such as a car, plane, doll, train or bulldozer on a micro dot, ink or print based, or other detectable play surface. Also, the invention changes the reading and game book form factor found in the Tag system, to a larger play surface, like a larger flat, 3D or typical play surface with micro printing or the like. The images found on the surface primarily are theme play set based rather than the words and stories in a typical Tag book. Thus, the invention allows a child to play interactive games and receive live spontaneous feedback based on movements of the toy on the surface, which can now be achieved in a reliable, accurate and cost effective manner.

[0006] Another limitation with a microdot pen form factor is that there would be no need to communicate to another pen for example, via Blue Tooth or other wireless connection. However, in an aspect of a toy embodiment of the invention, communication between two toys provides even further play scenarios in connection with a play surface with micro printing. For example, in a game with two children with two cars it could be determined who reached the finish line first. Many exciting play interactions are now possible between two communicating toys. The imaginative and creative learning benefit of this technology for children is unprecedented.

[0007] Although one embodiment of the invention is to place the pattern or material surface reader and processing components permanently into a toy, due to the high cost of the components, a child could be limited to one interactive toy and multiple play surfaces. Another aspect of the invention is to house the more costly reader and processing components in a modular shape that snap fits into housings of multiple different toys. Thus, this aspect allows multiple toys to work with one dot reader which fits a standard housing. This arrangement greatly reduces the cost of purchasing other toys and printed play sets. Other combinations of components in either the reader or toy housing are also possible. This pod or reader system could be updated via a computer or smart phone for free or for a fee in association with a website or online application store. This website or the like could provide additional story, game content, social interactions relating to the character housing and play surfaces. Stored data of the child's play activities could be uploaded to the website and shared with friends. Play activity and achievements can benefit the child on the website game including virtual social status as well as participation in the website, purchases or social activities could provide benefits for the real world play activities.

[0008] One game system in accordance with the present invention comprises a play surface having various unique printed patterns of detectable markings; a play pod having a sensor for detecting and a processor for evaluating a sequence of the detectable markings; and a toy housing for housing the play pod.

[0009] A more complete understanding of the present invention, as well as further features and advantages of the invention, will be apparent from the following Detailed Description and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. **1** illustrates a prior art pen based microdot sensor;

[0011] FIGS. **2**A and **2**B illustrate a reader of play pod module and a toy car housing for the reader, and a racetrack interactive play surface for use with the toy car in accordance with an embodiment of the invention;

[0012] FIG. **2**C shows a block circuit diagram of processor control circuitry for the reader of FIG. **2**A;

[0013] FIGS. **3**A and **3**B illustrate a toy train and a railroad track interactive play surface for use with the toy train in accordance with an embodiment of the invention; and

[0014] FIGS. **4**A and **4**B illustrate a toy unicorn and fairy princess interactive play surface for use with the toy unicorn in accordance with the present invention;

[0015] FIG. **5** illustrates a process in accordance with the present invention.

DETAILED DESCRIPTION

[0016] As one example of the present invention, several different racecars, such as race car **200** of FIG. **2**A may be employed with a micro dot printed racetrack, such as racetrack **250** of FIG. **2**B. While in one embodiment, a reader or play pod is fixedly housed in the car or other toy, in this embodiment it is releasably held, and the child can remove dot reader or play pod module **270** from one car and insert the dot reader into another car or another toy housing. The reader can then identify the new car or other toy housing and retrieve data and play schemes specific for that car or toy. Further details of the reader **270** are shown in FIG. **2**A and a processor control circuit for the reader **270** is shown in FIG. **2**C.

[0017] To further illustrate the scope of the invention, a scripted example of an interactive play session follows below. This play session could be based on a new challenge received from the online support system or from a friend via the online or website based system. Data from this activity is stored for future upload. Race play is selected by inserting the play pod **270** into the race car **200**. As seen in FIGS. **2**A and **2**C, a series of switches **276**, **278** and **280** are normally spring biased in an open position. When the play pod **270** is snapped into slot **280** of race car **200** a sequence of flats and protrusions selectively close one or more of the switches **276**, **278** and **280**. For the sake of example, let us assume a protrusion closes switch **276**, a flat leaves **278** open and a protrusion closes switch **280** effectively establishing a binary code of "101" which the processor **290** can decode as representing a race car or a particular race car as desired. It will be recognized additional switches can be employed to encode additional toys, or that alternative sensing arrangements may suitable be employed.

[0018] The child puts the car **200** anywhere on track **250**. The processor **290** of play pod drives a feedback means, such as speaker **292** to verbalize "It's the big Speed City race today, to be ready for the big race, we will need to get an oil change, fill up with gas and get our car washed before we get to the starting line". Engine sound feedback is also given based on how fast the car is moving around the track based on the detected interval of the patterns. "For fun, let's drive past the crowd first, so they can give us a big cheer." As the child moves the car **200** past the stands, the play pod **270** of the car **200** detects the sequence of microdots for the grandstand, and cheering sounds can be heard. More particularly, processor **290** as controlled by software stored in memory **298** interprets outputs from reader **274** as it reads the microprinting or other detectible patterns. An optical sensor or camera may be utilized. Alternatively, if the dots, additive inks or other markings are printed as bars and spaces, a bar code like reader may be suitably adapted. With markings in magnetic or other additive inks, a magnetic ink reader may be employed. Any sensor and print detection technology could be employed. Track ball or infrared mouse technology might also be suitably adapted.

[0019] Returning to the scripted play, "The crowd is going wild for you. Now, let's get some oil." If the child does not move the car **200** to oil station **204**, the child is prompted again. As oil station **204** is detected, "Great! We're at the oil station. We're going to need five quarts of high performance oil. Lift the hood and pour it in." Dripping oil sounds are heard five times. If the child pulls away early, he or she is directed back. For example, "Can't start the race without fresh oil."

[0020] The game may logically proceed. "Hmm. What is next? Oh that's right we need gas. Where is that gas station? Drive us over there!" If the child drives car **200** to gas station **206**, he or she may hear "Perfect! We'll need 20 gallons of high-octane racing fuel for our six-lap race. Filler up. Oh, wait, you have to pull up closer to the pump. The hose isn't long enough." The processor **290** of play pod **270** evaluates the sequence of outputs from reader **274** to sense if the car **200** is very close to the pump. If so, gas filling sounds are heard. "We're all filled up. It's Time for a shine. Where's the car wash? Let's go." When the child pulls the car **200** up to car wash **208**, washing sounds are heard. "Drive it through and we'll be sparkling clean." After detecting car **200** exiting the car wash, the announcer says "Everyone to the starting line immediately for the Speed City championship race." If it is detected that the child has pulled the car **200** up to starting line **210**, the child hears "Rev your engines" and engine sounds are heard. If not, the child is reprompted to go to the starting line.

[0021] Play continues: "We have a six-lap race and must refuel on lap three and get new tires at lap four. Get ready . . . 5, 4, 3, 2, 1. Go!" Feedback is provided on speed and lane choice. Warnings of upcoming hazards, like tires **204** in the road or cones **214**. Bonuses are given for jumping over the hazards or ramps. All feedback is based on interpreting of the unique printed patterns throughout the play surface. Processor **290** executing software can evaluate and score play actions. If the child goes off the track, a skid and crash sound is generated and a warning to "stay on the track or slow down" is given. If they go too far off the track, the race could be over or they must go back to the station **206** and fix the car **200**. Every time they pass the crowd in the grandstand **202**, cheers are heard. When the child is near the end of lap three, they are told to go to the pits for gas. Gas filling sounds are heard, until the car is full and "You're full, go go go!" is heard. "Reminder, one more lap and go to the pits for tires." The child pulls in to station **206** for tires. Sounds for four tire changes are heard. Then, "your tires are on Go ! Go! You have just 2 laps to go." If the child does not go into the pits, the tires will "blow out" on the next lap and the race is over.

[0022] Each lap is timed so the child is given a position in the race based on speed and staying on the track. "Completed lap four your top speed was 237 miles an hour and you are in second place. This is the final lap. Go as fast as you can to win, just don't hit the wall, a hazard or grass! The last lap, let's go. Here comes the finish line." Sounds of several race cars passing the finish line are heard. "You won the race! You won the race! You won the Speed City Cup! Let's drive by the crowd and then go to the winner's circle for the trophy." Crowd cheers as the car **200** passes the stands and announcer says, "Car **48** is the winner!" When the child pulls car **200** into the winner's circle **216**, "Car **48** won the six lap Speed City Cup with a top speed of 259 miles per hour!" Cheers are heard. "Whoo wee, I'm hungry and thirsty let's get something to eat at the food stand." The child moves car **200** to the food stand **218**. "What would you like to eat? Options are: Pizza, Hamburgers, Soda, Ice Cream." If the child pulls the car **200** up to the pizza station, he or she may hear "A large pizza pie for you champ, coming right up! That was delicious. I'll have another slice. Chomp Chomp Chomp. Boy I'm tired. Let's go back to the parking garage and take a quick nap!" Pull to garage **220** and hear "Yawn, ZZZZZ. Good night. Great race! Let's play on the fire loop track **222** next and put on a great dare devil show for the crowd!"

[0023] While the above example has been for a single car, it will be recognized two or more children can play, each with their own car with multiple play pods communicating via

Blue Tooth transmitter and receiver circuitry **296** or the like for interactive play or two cars can play games independently of each other. This play data can be stored and imported into the web based game program.

[0024] Distinctive micro pattern, hue or other uniquely identifiable printing patterns in combination with gesture and movement pattern identification algorithms may be advantageously used in a play based scenario for:

[0025] Identifying each lane of a racetrack such as track **250** with unique dot patterns which are printed on each lane: a left, middle and right lane, for example. The dot reader can be located at the proper angle and distance under the center of a car, for example and can identify a movement of a car from one lane to another.

[0026] The state of changing lanes and direction. The dot patterns in a lane can be sequential, if the dot input is reversed, the car can be identified as going in reverse and provide appropriate feedback.

[0027] The speed of the racecar with the rate of dot pattern input per a length of time indicating the relative speed of the car. Thus, travel time or lap time around the track from the starting line to the finish line can be determined. Various play and feedback methods can be offered relating to the speed of the vehicle.

[0028] The orientation of the car on the racetrack, for example, forwards, sideways or skidding, backwards or the like.

[0029] Outer edges of the left and right lane, such as a grassy infield or a wall. If the outer edges have a unique dot pattern near the virtual "wall" or the inside wall or grass, it can be detected and feedback responses like a "crashing" or skidding sound can be made, the car may be required to enter a pit stop for repair or points or score can be reduced.

[0030] The number of laps the car has traveled around the race track can be monitored by using a finish line printed area and or by monitoring the lane dot data followed by the finish line data. A virtual average lap speed can also be calculated.

[0031] The position of a car ahead of the other racecar. This determination can be made via communication between two cars as well as via lane position markers. For example, car one has seen a dot pattern indicating it is at the half way mark in the track, car two has seen a dot pattern indicating it is at the three quarters point. The two compare or transmit data via a wireless connection, like Blue Tooth. That interwoven data can also be uploaded to each player's website to be used for online play, feedback or benefits.

[0032] The pit zone can also contain unique identifying print based zones, which can be identified. Players can voluntarily enter the pit zone stations. Entering a pit stop zone, can be required for play activity based on speed and or the number of times around the track, hitting a hazard or due to crashing into a wall or grass. The stations could be for fuel, tires, or major repair stations. The child could be instructed to "virtually" repair or fuel a car during such a play scenario. A game might require that the player not move the car for a certain length of time, as verified by detecting no change in the dot pattern for that zone for the predetermined time. Sound effects and instructions can be given to the child to assist in their creative play until the allotted time has expired.

[0033] The distance of jumping a car in the air over a ramp or hazard can be sensed with the dot reader continuously reading the dot pattern followed by not seeing dots, followed by detecting continuous dots. There could also be special dot patterns located at jump and landing zones to determine distance. Other gesture or movement based patterns would be identified in the hazard area. The length of time the car is in the air and not identifying dots can indicate how long the car was up in the air or, in other words, how big the jump. The player could also be instructed to jump a car a certain distance to jump over a virtual, actual or printed obstacle or over virtual, actual or printed ramp.

[0034] These concepts illustrate only a few examples of how dot patterns can be utilized in a play set for guided play and imaginative play based activities. Each toy and play set can contain different dot printing techniques and detection algorithms relating to the particular toy and play set. New play scenarios can be downloaded or provided via game cartridge or other storage device.

[0035] Utilizing the dot reader **274** and processor **290** of play pod **270**, the system can offer children numerous play scenarios, which can be selected at random, based on the current detected activity or selected by the child using the toy or using the printed play scenario games.

[0036] One type of play could be guided play with more rules and goals. The instructions could be: "Go to the starting line, when the buzzer rings, drive around the track three times to the finish line, but try to stay in the left lane and don't hit the wall. Take a pit stop for tires after lap two." During the movement of the toy to achieve the goals, live feedback can be given.

[0037] Semi-guided play can have less rigid rules or goals. A semi-guided play scenario could be similar to guided play but allow the child greater creative expression and choices. For example, the goal could be a three lap race, but the child can go in for pit stops when they want to. However, if they go too long without a pit stop, the tires could blow out or they can run out of gas.

[0038] Non-guided play interprets the dot patterns and provides feedback to the child based on how they are using the car on the track to inspire creative play or provide realistic feedback based on their play actions. If the car is sitting at the starting line, the toy could sound the starting buzzer and tell him or her to race. There could be many movement and location based interpretations of the child's intended actions or movements of the toy on the printed surface. Mini challenges or play suggestions can be provided based on natural and unstructured use of the play surface. The engine sound could be generated based on the speed that the child moves the toy. If the child hits the wall, a crashing sound can be generated along with, such as audio feedback "be careful of the wall" or "We may need to go to the pit stop!" The processor could be programmed to look for several play scenarios based on one initial action and provide feedback based on the child's choices. A timeout feature would turn the game off for a predetermined time if play is detected as being too wild.

[0039] Toys may also have some unique onboard controls or sound effects that could interface with the dot reader via a communications port, such as a USB connector **294**, or other data communication means.

[0040] FIGS. **3**A and **3**B illustrate a train **300** and train track mat **350** for use therewith.

[0041] FIGS. **4**A and **4**B illustrate a unicorn **400** and princess adventure mat **450**.

[0042] External updates, interaction and rewards may be provided via online connection of the processor **290** to a personal computer (PC) or website. Additional online games and social interaction may be obtained via smart phone, online application store, game cartridge/storage device.

[0043] Reader **274** may also be employed to read an identifier on any of the play mats **250**, **350** or **450** to recall software and data for games specific to those play mats.

[0044] In another toy embodiment, dot patterns can be used in a play cooking scenario. The dot reader can be placed in a doll representing a chef and moved near a pretend pot, oven, mixer, or cooking tray. The items that represent ingredients, such as a plastic or faux peppershaker, a piece of steak, or a tomato slice can have unique dot printing patterns. The child can enjoy a variety of fun cooking activities based on following recipes and adding ingredients in the correct sequence and timing. The dot reader would verify that the recipe was followed in order and the proper number or amount of each ingredient was utilized. This system could teach young children how to actually cook or bake using the system.

[0045] In addition to camera and micro dot based toy movement gesture detection, other motion-based sensors can be also utilized to provide gesture and position data to increase the level of play interpretation and feedback such as gyroscopic, magnetic and acceleration sensors. For example, in an airplane and airport play set, a gyroscopic motion-based sensor can provide position feedback and play scenarios when the plane flying in the air and not on the microdot printed airport play set. These sensors could also be utilized within the microdot play set to enhance play.

[0046] Other similar camera and printing based technologies or grid based detection technology found in My First Leap Pod, with magnets located in the toy could also be employed in this invention.

[0047] FIG. **5** illustrates a method **500** of game play in accordance with the present invention. In step **502**, a play mat having a printed pattern of detectable markings is selected and placed on a surface where the game is to be played. Any flat surface of sufficient area, such as a floor or table top, will do. In step **504**, a play pod is inserted into a toy housing. The play pod will advantageously have a sensor for detecting and a processor for evaluating a sequence of the detectable markings. In step **506**, the type of toy housing is sensed and a software module suitable for the sensed type of the housing is loaded. In step **508**, user feedback is provided based upon evaluating the sequence of the detectable markings as the toy housing is moved on the play mat.

[0048] To play a different game, the user can select another play mat or another toy housing. When selecting another toy housing, the user removes the play pod from the first toy housing and inserts it into the new toy housing. The play pod senses the new toy housing and appropriate game software is loaded therefore. For example, different protrusions and flats will close a different pattern of switches **276**, **278** and **280**.

[0049] Micro dot play mats in accordance with the present invention can be simply printed on a large flat sheet of paper. Alternatively, they can be incorporated in a three dimensional play set or board having microdot printing thereon. As a further alternative, children and parents can print out play mats of their own designs with a standard color printer and appropriate computer software. For example, software loaded on a user's personal computer can guide the user through creating a dialog for a game. A play pod, such as the play pod **270** can have an optional connector such as the USB or other connector **294** allowing it to be programmed from a personal computer so that parents and children can personalize games as they choose. Game mats and game scenarios can be advantageously shared with other players over the web.

[0050] Although the invention has been discussed with respect to certain embodiments, it should be recognized that the invention comprises the novel and non-obvious claims and their insubstantial variations supported by this disclosure.

I claim:

1. An interactive play system comprising:
a play surface housing a printed series of detectable markings;
a reader system having a sensor for detecting and a processor for evaluating a sequence of the detectable markings;
a means to provide feedback based on the detected pattern series; and
a toy housing for housing the reader system.

2. The game system of claim **1** wherein the play surface has a flat surface printed with micro patterns.

3. The game system of claim **1** wherein the play surface is printed with micro patterns with infused inks.

4. The game system of claim **1** wherein the play surface is printed with a detectable hue or color pattern.

5. The game system of claim **1** wherein the toy is a race car and the play surface has a printed race track.

6. The game system of claim **1** wherein the reader system has a speaker to provide feedback, the speaker being driven by a processor which evaluates the detectable markings and drives the speaker to provide aural user feedback.

7. The game system of claim **1** wherein the toy housing releasably houses the reader system.

8. The game system of claim **7** wherein the reader system stores unique software for multiple different types of toy housing.

9. The game system of claim **7** wherein the reader system can store software play scenarios for multiple different types of play surfaces associated with a single toy housing.

10. The game system of claim **1** wherein the processor communicates with a remote computer to share and receive content.

11. The game system of claim **10** wherein player data is transmitted to an online play site.

12. The game system of claim **8** wherein the reader further comprises a sensor for sensing a type for the toy housing upon insertion of the reader into the toy housing.

13. The game system of claim **12** wherein a processor in the reader retrieves the unique software for the type of housing detected upon insertion.

14. The game system of claim **1** wherein the sensor for detecting a sequence of the detectable markings is also utilized to sense an identifying marking to identify the play surface.

15. The game system of claim **1** wherein the reader system stores software modules for different games to be played with the toy housing and the play surface.

16. The game system of claim **15** wherein a particular software module is retrieved and executed in response to detected placement of the toy housing and reader system housed therein on the play surface.

17. The game system of claim **1** wherein movement of the toy housing on the play surface is scored by the processor based upon evaluating the sequence of the detectable markings.

18. A game method comprising:
placing a play surface having a printed pattern of detectable markings on a surface where the game is to be played;

inserting a play pod into a toy housing, the play pod having a sensor for detecting and a processor for evaluating a sequence of the detectable markings;

sensing the toy housing and loading a software module suitable for the sensed toy housing; and

providing user feedback based upon evaluating the sequence of the detectable markings as the toy housing is moved on the play mat.

19. A method of providing an interactive play scenario comprising:

printing a series of micro patterns on a play surface in combination with a printed play scene;

programming a reader to detect each series of micro patterns based on a motion of a toy housing containing the reader; and

providing feedback based on detecting a series of micro patterns relating to the motion of the toy housing.

20. The method of claim **19** further comprising:

providing a series of audible commands; and

providing further feedback based on a detected accuracy of following said commands as a child moves the toy housing on the play surface.

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