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Simulation Research on the Application of Visual Image Capture Technology in Sports Injury Rehabilitation

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Abstract: In order to improve the effect of sports injury rehabilitation, this paper combines visual image capture technology to carry out simulation research on sports injury rehabilitation. Moreover, this paper uses the Metropolis sampling method to adaptively sample the paths in the path space. In addition, by combining the bidirectional transfer strategy with large transfer ability and the viewpoint path perturbation transfer strategy with small transfer ability, this paper performs a more efficient traversal of the entire path space, and uses a combination of Monte Carlo ray tracing to calculate direct illumination and Metropolis method to calculate indirect illumination to improve image capture effects. The simulation study shows that the visual image capture technology proposed in this paper has better application effect in sports injury rehabilitation.

Keywords: visual image; capture technology; sports injury; rehabilitation
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1 INTRODUCTION

Different types of sports injuries need to be treated in an emergency to avoid greater damage to the human body. Moreover, sports injuries are more common in life. Based on relevant research, sports injuries can be classified into three types: acute injury, chronic injury and old injury according to the priority of the onset. In high-intensity sports, acute injuries are particularly common, and injuries generally occur under the action of instantaneous violence, and the symptoms of injury take a long time to appear, and are characterized by rapid onset of symptoms and rapid onset [3]. In all kinds of sports, sports injuries in rugby and football are mostly acute injuries, and people participating in sports will suffer sprains and bruises during collision and running. In addition, for acute injury, if not treated in time, bursitis, dislocation, etc. will be induced. Chronic injuries are generally when the arms, legs, etc. are under high load for a long time, and soft tissue is injured due to excessive endurance [15]. People who love sports and professional athletes are at high risk of chronic sports injuries, which have the characteristics of slow onset and long symptoms. After a sports injury occurs, it is very important to deal with it in time. If the acute sports injury is not treated in time and the treatment effect is not good, it will evolve into an old injury, making the injury course longer [11].

Abrasion is a minor injury, mostly epidermal abrasions. Only basic potions are required for treatment. If the scratched epidermis oozes blood or the wound is dirty, the wound should be cleaned first, and then the potion should be applied. A sprain is an injury that occurs when a joint is suddenly twisted during exercise. Among such sports injuries, lumbar sprains and joint sprains are more common, among which joint sprains include sprains of the knee, hip, ankle and other parts [14].

Muscle strain is also a common sports injury, which refers to the injury that occurs after the muscle fibers are torn due to various external forces. After a muscle strain, the injured person can judge the severity of the sports injury according to the degree of pain in the strained area. Under normal circumstances, cold compress, massage, and hot compress are the main ways to deal with muscle strain, but for some patients with chronic muscle strain, after early treatment, the body's own resilience should also be used to repair the injury at the muscle [9].

Dislocation and fracture are sports injuries with a high occurrence rate. In common sports such as football, basketball, volleyball, and badminton, there is a risk of inducing dislocation or fracture. After dislocation, it is often not possible to move the patient at will, and the dislocation site needs to be fixed and immediately sent to the hospital [16]. For injuries such as fractures, the symptoms of patients are different, and the types of fractures are different, which can be divided into open fractures and closed fractures. Among them, in patients with closed fractures, the skin is generally not broken, and there is no wound, and the fracture site has not yet communicated with the outside world; in patients with open fractures, the bone may pierce the skin, and the wound will directly contact the external environment [1] .

Contusion in sports injury refers to tissue damage after being hit by an external force. After injury, for mild contusion, no treatment is generally required, and it can recover slowly after 24 hours; for heavier contusion, it should be treated with medicinal wine, corresponding plaster, and combined with certain physical therapy. According to the survey, in basketball and volleyball, contusions are very common, and the non-standard catching action and volleyball hitting action are the main reasons for this kind of sports injury [4].

Sports injuries are very common in sports. If the awareness of sports injury prevention is insufficient, there will be insufficient preparation and neglect of sports injury knowledge during exercise. On the one hand, people who participate in sports fail to pay attention to the importance of preventing sports injuries due to their weak awareness of prevention. Therefore, in the process of exercising, they do not participate in sports in accordance with the requirements of sports, and the risk of sports injuries increases[17] . On the other hand, weak awareness of sports injury prevention also makes participants ignore the preparations before exercise. If athletes and students cannot fully mobilize the nervous system through warm-up and preparation actions, their muscle extension ability and movement coordination will be limited, and then sports injuries will occur during sports. In addition, mental state can also cause sports injury problems. For example, during exercise, if participants are blindly confident, they will ignore the control of exercise volume and exercise behavior, which will lead to the risk of sports injury [7].

Excessive exercise is one of the causes of sports injuries. During exercise, if the force is concentrated on a certain part for a long time, it will lead to an increase in the local force and a larger burden on the part, thus causing sports injury. In special sports and college physical education courses, the amount of exercise is not controlled properly, and physical exercise for a long time will cause sports injuries due to physical fatigue and local overburden. For example, in physical education courses, sports such as shot put, horizontal bar, and volleyball are arranged centrally, and students' arms repeatedly exercise, and the amount of exercise of upper limbs exceeds the tolerable range, which is prone to arm fractures, upper limb muscle strains and other sports injuries [12].

Under normal circumstances, the level of tactical, physical, and special technical training in sports events is not high, which will lead to sports injuries. People who do not have adequate physical training have poor muscle elasticity and basic strength, slow response during exercise, and insufficient flexibility of body joints. Therefore, during exercise, sports injuries will occur due to the body itself. In addition, sports behaviors and irregular body movements can also cause sports injuries due to partial body strain and accidental stress [5].

In order to effectively prevent sports injuries, relevant personnel should adhere to the following principles when participating in sports. First of all, take the initiative to learn and understand the knowledge of sports injuries, master the causes of sports injuries and basic prevention methods, and at the same time strengthen the ideology of preventing sports injuries, and avoid sports injuries caused by self-confidence. Secondly, do preparatory activities before exercise, scientifically screen sports items and physical exercise content, and reasonably control exercise load. For the knee joint, shoulder joint, waist and other high-risk parts of sports injury, it is necessary to improve the function of this part to prevent sports injury [2]. Finally, in the process of preventing sports injuries, it is also necessary to prevent minor injuries caused by long-term excessive stress on parts of the body. Such injuries will become chronic strains after continuous accumulation, and the overall treatment difficulty will increase. In addition, when participating in sports, one should choose a safe and reliable place, pay attention to medical supervision during exercise, and formulate an exercise plan scientifically[6].

Only by adopting correct and reasonable training methods and proper physical exercise can we effectively prevent sports injuries. Therefore, relevant personnel should ensure the rationality of their own training methods and scientifically adjust the exercise plan during the physical exercise process. Specifically, according to the different age, physical fitness, health level, and gender, the training program should have certain differences. During sports, we should adhere to the principle of gradual progress and teaching students in accordance with their aptitude. For example, when younger people participate in sports, they should focus on whole-body training; when arranging sports, the physical characteristics and physical quality of athletes should be comprehensively considered [8]. The overall exercise training method should adhere to the principles of low density and low exercise intensity, and the training time should not be too long. For colleges and universities, in terms of preventing sports injuries, training programs in physical education courses should be further improved. For example, teachers can apply basic sports techniques according to the requirements of students' physical quality training, so that students can master the training essentials of throwing, running and jumping, and with the goal of improving students' physical quality, reasonably arrange the density of physical education courses. In the process of participating in sports, teachers and professional trainers should correctly demonstrate sports movements and adhere to the guiding principle of step-by-step. In the process of exercising, guide the relevant personnel to start with the decomposition of the action and the complete exercise method, and systematically learn a certain exercise skill to ensure that they have a good grasp of the exercise method [10].

Allow time for relaxation during exercise. After each set of exercises, the body should be properly relaxed to relieve muscle fatigue and avoid continued increase in local burden. For example, after each set of training, athletes will eliminate physical fatigue by relaxing running to avoid sports injuries after continuous training. It should be noted that different sports have different relaxation methods at intervals, and the specific relaxation method should be related to the sports. If the exercise program mainly exercises the upper limbs, you can choose jogging, which mainly uses the lower limbs, for relaxation. You can also relax properly by lying on your back and standing upside down, so that the blood in the body can flow back quickly and inhibit the fatigue of the nervous system. Avoid overstressing any part of the body. A large amount of exercise and the continuous concentration of exercise in the same part can easily cause sports injuries. Therefore, during exercise, self-protection can be strengthened by preventing local overburden [13].

This paper combines visual image capture technology to carry out simulation research on sports injury rehabilitation, so as to improve the rehabilitation effect of sports injury.

2 MOTION IMAGE CAPTURE ALGORITHM

2.1 Metropolis Method

We consider a state space Ω and a nonnegative function $f:\Omega \to \mathbb{R}^{+}$ defined on this space. We are in an initial state $\bar{X}_0 \in \Omega$, and our purpose is to generate a random process $\bar{X}_0, \bar{X}_1, \ldots$. No matter which initial state $\bar{X}_0$ starts from, the random process will gradually converge to a distribution proportional to the function f, which is called the steady-state distribution.

Here, each state $\bar{X}_i$ is obtained by some random change from its previous state $\bar{X}_{i-1}$. This random process in which the state $\bar{X}_t$ at each moment is only related to the state $\bar{X}_{t-1}$ at the previous moment is called a Markov chain. We can define the transition probability $K(\bar{x} \to \bar{y})$, which indicates the probability of transitioning from the current state $\bar{x}$ to the state $\bar{y}$ at the next moment.

The state $\bar{X}_i$ at each moment is a random variable with a certain probability distribution p_i. We can obtain the probability distribution of the current moment from the probability distribution p_{i-1} and transition probability of the previous moment, as follows:

$$p_i(\bar{x}) = \int_{\Omega} K(\bar{y} \to \bar{x}) p_{i-1}(\bar{y}) d\mu(\bar{y}) \tag{2.1}$$

As this process progresses, a steady-state distribution p^* will eventually be reached. The so-called steady-state distribution means that no matter what type of transfer is performed, the current steady-state distribution will remain unchanged, namely:

$$p^*(\bar{x}) = \int_{\Omega} K(\bar{y} \to \bar{x}) p^*(\bar{y}) d\mu(\bar{y}) \tag{2.2}$$

Certain complex functions can be approximated using the Metropolis method. First, starting from a point $\bar{X}_0$ in the state space Ω that defines the function f, the state $\bar{X}_1$ at the next moment is generated according to the transition probability K. It is also equivalent to sampling the state space Ω once. Then, we record the sampling points in the sampling distribution histogram and continue this process. At first, the state distribution at those moments is very different from the steady state distribution, which means that our sampling points do not come from the steady state distribution. However, as the Markov chain grows, our state distribution at each moment gradually tends to a steady state distribution, which is guaranteed by the detailed balance and probabilistic acceptance we will introduce below. The shape of the sampling distribution histogram composed of our sampling points is also close to the function curve. When a certain accuracy is achieved, we can directly scale the sampling distribution histogram to obtain the function f. Figure 1 shows the cumulative sampling using the sampling distribution histogram. As the transition between different states (such as between $\bar{x}$ and $\bar{y}$) continues, more and more sample points are accumulated in the histogram. There is a certain difference between the sampling distribution (green curve) and the steady-state distribution (red curve) at the beginning, and it gradually approaches the steady-state distribution as time develops.

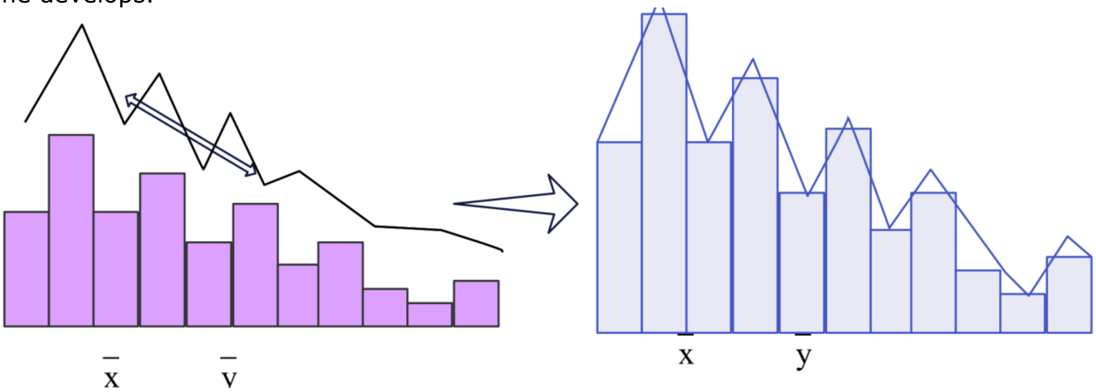

Figure 1: Steady-state distribution achieved by cumulative sampling.

The Metropolis algorithm employs a method called detail balance to ensure that our Markov process tends to a steady state distribution.

If we assume that we are in the state $\bar{X}_{i-1}$ at the current moment, we can get the sampling $\bar{X}_t$ of the next moment by the following method. First, we can generate the temporary sampling point $\bar{X}_i'$ at the next moment according to our pre-agreed arbitrary transition strategy. The transition function of the transition strategy we adopt is defined as $T(\bar{y}\,|\,\bar{x})$. This function gives the transition probability from $\bar{X}_{i-1}' = \bar{x}$ to $\bar{X}_i' = \bar{y}$. We call this transfer function $T(\bar{y}\,|\,\bar{x})$ a temporary transfer function. Because we have only made one attempt on how to transfer, our attempt may be accepted or rejected, depending on the acceptance probability $a(\bar{y}\,|\,\bar{x})$ that we will define below. In this way, we can get the state of the next moment as follows:

$$\bar{X}_i = \begin{cases} \bar{X}_i' \text{ ,} Probability\ a\left(\bar{X}_i'\,|\,\bar{X}_{i-1}\right) \\ \bar{X}_{i-1} \text{ ,} Probability\ 1 - a\left(\bar{X}_i'\,|\,\bar{X}_{i-1}\right) \end{cases} \tag{2.3}$$

Now, the whole question becomes how to define the acceptance probability $a(\bar{y}\,|\,\bar{x})$. We assume that now that we have reached the steady state, we must define the transition probability K so that the steady state we have reached can be maintained. We can think of it this way, considering the two bits in the histogram of the sampling distribution, that is, the two states in the state space, $\bar{x}$ and $\bar{y}$. From a macroscopic point of view, we have reached a steady state, but on a microscopic level, different states have been transferring to each other. However, the number of samples to transition from state $\bar{x}$ to state $\bar{y}$ must be equal to the number of samples to transition from state $\bar{y}$ back to state $\bar{x}$. We call this the detail balance equation, which is:

$$f(\bar{x})T(\bar{y}|\bar{x})a(\bar{y}|\bar{x}) = f(\bar{y})T(\bar{x}|\bar{y})a(\bar{x}|\bar{y}) \tag{2.4}$$

We can show that steady state can be maintained when this condition is satisfied.

Equation 6 gives the method for calculating the acceptance probability $a(\bar{y}|\bar{x})$. Since $f(\bar{x})$ is known, then $T(\bar{y}|\bar{x})$ is determined by the transfer strategy we arbitrarily choose. Therefore, we can get $a(\bar{y}|\bar{x})/a(\bar{x}|\bar{y})$. Our requirement for the reception probability is to increase the value of the reception probability as much as possible. The purpose of this is to make our process reach a steady state as soon as possible. To achieve this, we can define the acceptance probability $a(\bar{y}|\bar{x})$ as follows:

$$a(\bar{y}|\bar{x}) = min\left\{1, \frac{f(\bar{y})T(\bar{x}|\bar{y})}{f(\bar{x})T(\bar{y}|\bar{x})}\right\} \tag{2.5}$$

In this way, the larger of $a(\bar{y}|\bar{x})$ and $a(\bar{x}|\bar{y})$ can be set to 1. It indicates that the transition between the two states, the transition in one direction will be accepted, and the transition in the other direction will be accepted with a certain probability. Setting the receiving probability in this way can not only ensure the satisfaction of the detail balance condition, but also make the approach speed to the steady state the fastest.

2.2 Metropolis Ray Tracing

According to the path integral form of the rendering equation, $\Phi(S_j) = \int_{\Omega} f_j(\bar{x})d\mu(\bar{x})$ represents the radiant flux from the light source to pixel j along some path, the path $\bar{x}$ consists of a sequence of points $x_0x_1\ldots x_k$ on the patch in the scene, and k is the length of the path. We can decompose the integrand in the form of the path integral into two parts, pixel-independent and pixel-dependent:

$$f_j(\bar{x}) = w_j(\bar{x})f(\bar{x}) \tag{2.6}$$

Among them, $w_j(\bar{x})$ is the flux response function, which determines which pixel will be affected by the contribution of the path, it is only related to the first section x_0x_1 of the path, and $f(\bar{x})$ is other parts that are not related to pixels. In this way, the MonteCarlo method is used to solve this integral, that is, the path space is sampled according to a certain distribution, as follows:

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$$\Phi\left(S_j\right) \approx \frac{1}{N}\sum_{i=1}^{N}\frac{w_j\left(\bar{X}_i\right) f\left(\bar{X}_i\right)}{p\left(\bar{X}_i\right)} \tag{2.7}$$

If we sample the path space using a distribution proportional to the function f, $p=(1/b)f$, and we can calculate the radiant flux per pixel as follows:

$$\Phi\left(S_j\right) \approx \frac{1}{N}\sum_{i=1}^{N} b w_j\left(\bar{X}_i\right) \tag{2.8}$$

Among them, $b=\int_{\Omega} f(\bar{x})d\mu(\bar{x})$ is the radiant flux through the image plane. To sample the path space with a stationary distribution proportional to the function f, we can use the Metropolis sampling method.

How to solve the problem of initial deviation is the key of Metropolis algorithm. It directly determines the speed of Metropolis convergence. We can solve the problem of starting bias by randomly deciding the starting sampling seed.

First, we can obtain the initial seed $\bar{X}_0$ by sampling the path space according to some known sampling distribution p_0, and we use bidirectional path tracing here. Since p_0 is not actually distributed proportional to f, we must assign a weight to the starting seed $\bar{X}_0$:

$$W_0 = \frac{f\left(\bar{X}_0\right)}{p_0\left(\bar{X}_0\right)} \tag{2.9}$$

This way we can proceed with our Metropolis process from sample $\bar{X}_0$, and subsequent samples $\bar{X}_1, \bar{X}_2, \ldots \bar{X}_N$ can be gradually generated by transfer. In order to achieve unbiasedness, we should assign the same weight $W_i = W_0$ to each sample like a seed, so that the radiation flux of each pixel becomes the following calculation:

$$\Phi\left(S_j\right) \approx \frac{1}{N}\sum_{i=1}^{N} W_i w_j\left(\bar{X}_i\right) \tag{2.10}$$

In order to change the problem of excessive variance, we can obtain n paths $\bar{X}_0^{(1)}, \ldots, \bar{X}_0^{(n)}$ by sampling multiple times using the distribution p_0 of bidirectional path tracing, and the weight of each path is:

$$W_0^{(i)} = \frac{f\left(\overline{X}_0^{(i)}\right)}{p_0\left(\overline{X}_0^{(i)}\right)} \tag{2.11}$$

We can only take one path as the seed, that is, m=1, so the purpose of this step is to calculate the mean of the weights of n paths, which can also be regarded as the brightness of the entire image. Because:

$$E\left[W_0\right] = \int f = b \tag{2.12}$$

The transition strategy should have good traversal properties. In the Metropolis method, we can start from a random starting seed $\overline{X}_0$, go through several random transitions, and finally converge to a steady state distribution. This steady-state distribution should be the same no matter how we choose the starting seed $\overline{X}_0$, which requires our transition strategy to have good traversal characteristics of the entire path space. In order to do this, for any two paths $\overline{x}$ and $\overline{y}(f(\overline{x})>0, f(\overline{y})>0)$, they have a certain probability that they can be transferred to each other, namely $T(\overline{y}|\overline{x})>0$. If this condition is not met, it is very likely that our path is transferred in a certain area of the scene but cannot jump out of this area, (as shown in Figure 2). The light source and the eye are blocked by a large obstacle, leaving only two narrow passages. If we only provide the transfer strategy of adding and removing one node, we can't get the path to the light source through the right channel anyway, which makes us lose a part of the path space.

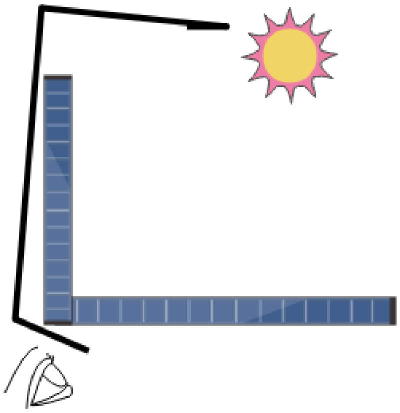

Figure 2: Virtual light source position.

To perform partial deletion of paths, we must select the deleted sub-paths. If we assume that our current path is $\overline{x} = x_0 x_1 \dots x_k$, we can delete any sub-path, and the probability of deleting the sub-path $x_s .. x_t$ is $p_d[s,t]$. Deleting a subpath $x_s \dots x_t$ indicates that what we want to delete is a sub-path between point s and point t that does not include two endpoints, including t-s edges and t-s-1 points. To determine $p_d[s,t]$, we can divide into two steps. We first determine the length l_d of the sub-path to be deleted this time, and then determine from which point to delete such a long sub-path, and we use $p_{d,1}, p_{d,2}$ to represent the probability of selecting these two events. We can use:

$$p_d[s,t] = p_{d,1} \times p_{d,2} \tag{2.13}$$

get $p_d[s,t]$. The selection principle of the first event is that the probability of deleting sub-paths with a smaller length is greater, and the probability of deleting all paths is the smallest. The purpose of our design is to delete the shorter sub-paths and cause less changes to the whole path, so that we can obtain a relatively large reception probability. However, we also provide the possibility to delete all paths, so as to ensure our traversal of the entire path space. The specific settings are as follows:

$$p_{d,1}[l_d] = \begin{cases} 0.25 l_d = 1 \\ 0.5 l_d = 2 \\ 2^{-l_d} \ other \end{cases}$$

For the selection of the second event, we use equal probability selection. That is, we can delete this sub-path from every node that can delete a sub-path of length l_d. After determining $p_{d,1}, p_{d,2}$, we sample the two probabilities separately, and then delete the path according to the sampling results, and then we get the two remaining sub-paths $x_0 \ldots x_s$ and $x_t \ldots x_k$.

Next, what we need to do is to randomly generate new sub-paths and connect the two remaining sub-paths $x_0 \ldots x_s$ and $x_t \ldots x_k$ that are left after deleting the sub-path. We generate a path of length s' and length t' at both ends of these two sub-paths, and then connect them to obtain a new path. As in the case of deleting sub-paths, we also take a two-step approach to determine the probability density function $p_a[s',t']$ of the event of adding sub-paths:

$$p_a[s',t'] = p_{a,1} \times p_{a,2} \tag{2.14}$$

Among them, $p_{a,1}$ represents the probability of adding a path of length l_a, and $p_{a,2}$ represents the probability of adding a long path at which endpoint. The length l_a of the added sub-path is determined in this way, we give the same sub-path length l_a of adding and deleting sub-path length l_d a greater probability. At this time, the length of the path before and after the change is unchanged, the change to the path is relatively small, and a relatively large reception probability can be obtained. The specific settings are as follows:

$$p_{a,1}=\begin{cases}0.5l_a=l_d\\0.15l_a=l_d\pm 1\\0.05l_a=l_d\pm 2\\\ldots\ other\end{cases}$$

We give an example to illustrate how the two-way transfer strategy works. As shown in Figure 3, $\overline{x}$ is the path $x_0x_1x_2x_3x_4$, we delete the sub-path $x_1x_2x_3$, and then find a new point y_0 by emitting a ray from point x_1, and then connect y_0 and x_3 to get a new path $\overline{y}=x_0x_1y_0x_3x_4$.

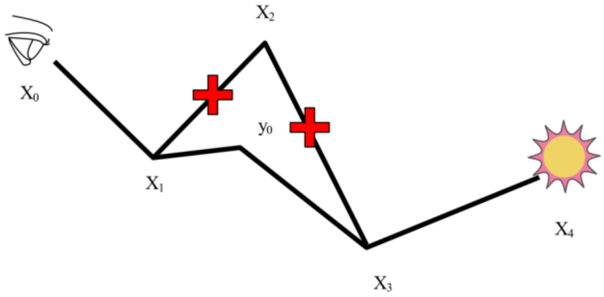

Figure 3: Bidirectional path transfer strategy.

We can calculate $f(\overline{y}),f(\overline{x})$ like this::

$$f(\overline{y})=f_r(x_0\rightarrow x_1\rightarrow y_0)G(x_1,y_0)f_r(x_1\rightarrow y_0\rightarrow x_3)G(y_0,x_3)f_r(y_0\rightarrow x_3\rightarrow x_4)$$

$$f(\overline{x})=f_r(x_0\rightarrow x_1\rightarrow x_2)G(x_1,x_2)f_r(x_1\rightarrow x_2\rightarrow x_3)G(x_2,x_3)f_r(x_2\rightarrow x_3\rightarrow x_4)$$

We calculate $T(\overline{y}|\overline{x}),T(\overline{x}|\overline{y})$ like this:

$$T(\overline{y}|\overline{x})=p_d[1,3]\begin{bmatrix}p_a[1,0]\,pdf(x_0\rightarrow x_1\rightarrow y_0)G(x_1,y_0)\\+p_a[0,1]\,pdf(x_4\rightarrow x_3\rightarrow y_0)G(x_3,y_0)\end{bmatrix}$$

$$T(\overline{x}|\overline{y})=p_d[1,3]\begin{bmatrix}p_a[1,0]\,pdf(x_0\rightarrow x_1\rightarrow x_2)G(x_1,x_2)\\+p_a[0,1]\,pdf(x_4\rightarrow x_3\rightarrow x_2)G(x_3,x_2)\end{bmatrix}$$

In this way, we calculate the probability of acceptance $a(\overline{y}|\overline{x})$.

The first section path x_0x_1 from the viewpoint can better reflect the influence of the disturbance on the final result image. We mainly consider perturbing the first section path, which is called viewpoint path disturbance.

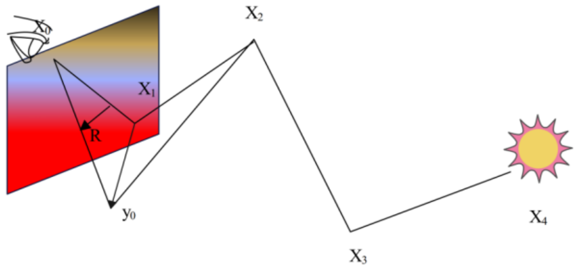

Figure 4: Perturbation transfer strategy of viewpoint paths.

As shown in Figure 4, we need to perturb the viewpoint path of the path $x_0x_1x_2x_3x_4$, which is to perturb the first path x_0x_1. We make a random offset R to a random direction ϕ from the position left by the original path x_0x_1 on the screen. Here, ϕ is chosen uniformly, while R is chosen according to:

$$R = r_2\, exp\left(-ln\left(r_2 / r_1\right)U\right) \tag{2.15}$$

Among them, U is a uniformly distributed random variable between [0, 1], r_1 and r_2 are two parameters, we set r_1 to be 0.1 pixel wide and r_1 to be 5% of the entire image size.

3 APPLICATION SIMULATION OF VISUAL IMAGE CAPTURE TECHNOLOGY IN SPORTS INJURY REHABILITATION

Combined with the algorithm of the second part, a sports injury simulation system based on image capture technology is constructed.

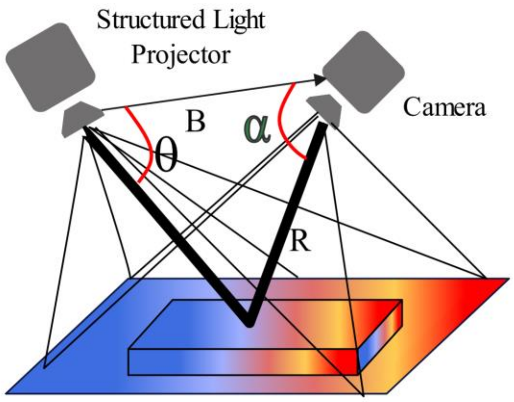

Figure 5: 3D reconstruction of structured light.

In this paper, the visual image processing is carried out on the basis of the three-dimensional reconstruction of structured light shown in Figure 5. For the recognition process of sports injury, Figure 6 shows the schematic diagram of sports injury recognition.

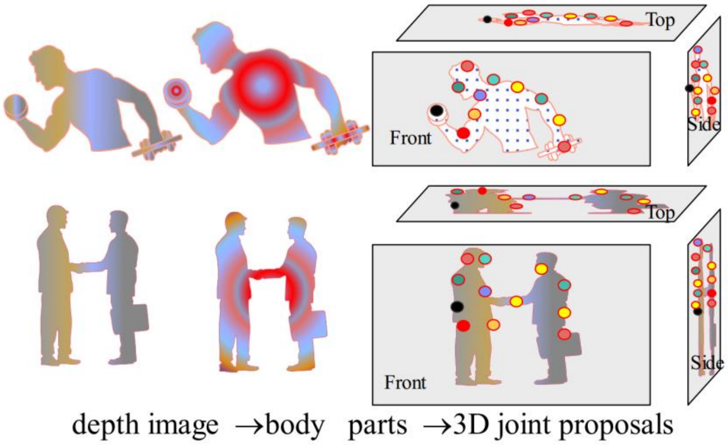

Figure 6: Schematic diagram of sports injury recognition.

Figure 7 is the flow chart of the calculation of the center of gravity of the human body. Combined with the algorithm of the second part, the image center is analyzed, and the research is carried out through the visualization method to improve the recognition effect of sports injury.

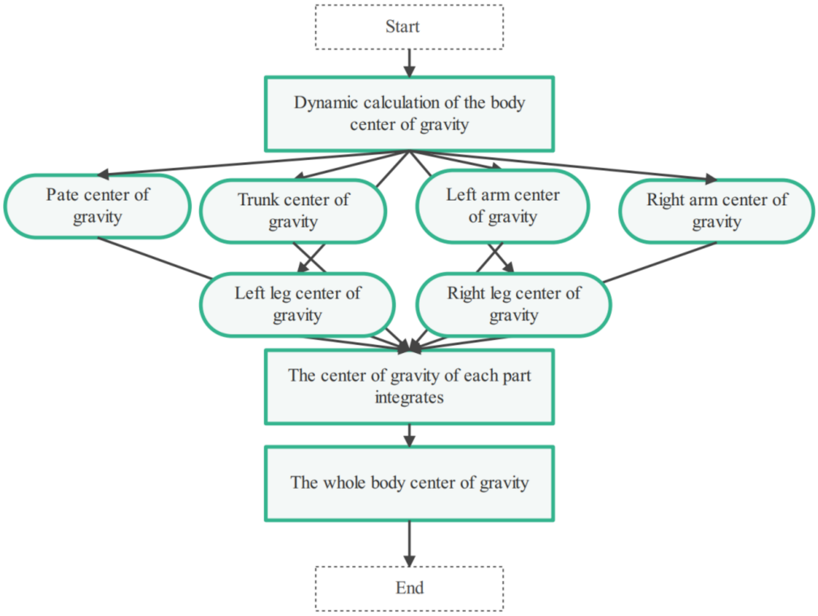

Figure 7: Image feature injury recognition process.

After the above model is constructed, combined with the simulation, the model proposed in this paper is used to study the effect of sports injury simulation. Figure 8 shows an example of a schematic diagram of the model in this paper for sports injuries.

(a) Illustration 1 of injury recognition

(b) Illustration 2 of injury recognition

(c) Illustration 3 of injury recognition

Figure 8: Schematic diagram of sports injury recognition.

Through multiple sets of simulations, the model proposed in this paper is verified, and a variety of sports injuries are identified, and the recognition effect is counted, and the results shown in Table 1 below are obtained.

NO.	*Damage identification*	*NO.*	*Damage identification*
1	*89.183*	*20*	*88.939*
2	*90.218*	*21*	*87.468*
3	*88.857*	*22*	*90.997*
4	*88.858*	*23*	*91.099*
5	*89.125*	*24*	*87.680*
6	*91.024*	*25*	*91.926*
7	*92.329*	*26*	*87.381*
8	*88.077*	*27*	*90.027*
9	*90.089*	*28*	*89.369*
10	*91.221*	*29*	*89.089*
11	*90.760*	*30*	*92.125*
12	*87.985*	*31*	*91.974*
13	*87.631*	*32*	*88.075*
14	*89.056*	*33*	*88.839*
15	*89.073*	*34*	*92.881*
16	*92.499*	*35*	*91.375*
17	*92.924*	*36*	*90.710*
18	*89.403*	*37*	*92.414*
19	*92.216*	*38*	*88.242*

Table 1: The application effect of visual image capture technology in sports injury rehabilitation.

From the above research, it can be seen that the visual image capture technology proposed in this paper has better application effect in sports injury rehabilitation, can effectively improve the effect of sports injury recognition, and play an important role in promoting sports injury rehabilitation.

4 CONCLUSION

Sports injuries are injuries that occur to the body under the influence of various factors during physical exercise and participation in sports. In ball games, about 35% of people are accompanied by sports injuries. The injury rate of aerobics sports was 12%, and the injury rate of martial arts sports was 16%. Among all sports injuries, joint sprains accounted for 38.15%, abrasions accounted for 25%, and contusions accounted for 18%. These sports injuries will cause certain damage to the human body, which is not conducive to the development of sports projects. Common sports injuries include elbow joints, scapulae, calves, arms, etc. This paper combines visual image capture technology to carry out simulation research on sports injury rehabilitation, so as to improve the rehabilitation effect of sports injury. The simulation study shows that the application effect of the visual image capture technology proposed in this paper is relatively good in sports injury rehabilitation, which can effectively improve the recognition effect of sports injury, and play an important role in promoting sports injury rehabilitation.

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